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# Creativity Matters:
# Community College and the Expansion of Access to Architectural Education

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# Creativity Matters:
# Community College and the Expansion of Access to Architectural Education

**by**

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# Dedication

*To community college students everywhere,*

*for forging your own path*

*which is the ultimate creative act.*

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# Abstract

## Creativity Matters:
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This research explores the unique characteristics of architectural education in the community college setting. The perspectives of several disciplines, including architecture, education, psychology, and philosophy, are brought to bear. The community college educational model allows for all who wish to enroll in architectural design to acquire an education in the discipline without prerequisites, preconceptions, or institutional barriers. This approach is the inverse of the university model wherein architecture students are preselected for admission based on prior scholarly achievement, assessments of aptitude, and the likelihood of success in the discipline. The research looks to the causes of individual creativity, and from those causes create an adaptable framework for architectural education at community colleges, one that can accommodate a variety of student learning styles and preparedness while maintaining a high level of quality, rigor, and clarity.

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## Chapter 1: Introduction: *What's Wrong with Architectural Education?*

The diversity of students in architecture school contributes directly to the diversity of the profession as a whole. Assessing diversity in architectural education by merely applying demographic measures of the student body only along gender and racial lines, however, would be incomplete. A fairer examination of student diversity would consider the diversity of class, socioeconomic status, age, learning styles, physical abilities, life experience, religion, place of birth, and previous exposure to the architectural profession. Issues concerning pedagogy linked to traditionally-underrepresented populations entering architectural study are critical to the future health of the profession and the continued relevance of architects to making the physical, built environment (Glasser, 2000, p. 251-252).

The primary institutional barrier hindering diversity in the architectural *profession* is access to architectural *education*. The size of the pipeline to the profession directly impacts the makeup of architect leaders who will have an impact on the values promoted and shared by architects in their selection of building projects (De Graft-Johnson, 2005, p. 1035). Many students are not exposed to architecture as a possible field of study, or as a profession, early enough or often enough to have an influence on their academic choices. That is, there is not much opportunity for most students to take an architecture course in a low-stakes academic environment without previously having been admitted to a university, and many young people, indeed most, are simply not aware of architecture

as an available career path (Doyle and Senske, 2017, p. 59). Moreover, many university programs operate behind a wall of extra prerequisites for admission to a college or school within a university. Intentionally or not, this has a suppressive effect on enrollment by students of specific populations due to institutional hurdles that have very little to do with architecture. Some may argue that this system is optimal as only the most dedicated students will persevere through this filtering process, but even those students selected for admission to college may end up starting an architecture program without any previous exposure to an architecture studio and without any familiarity with the unique nature of architectural education.

Open enrollment institutions such as public schools at the elementary and secondary school levels, and community and junior colleges at the post-secondary level offer an opportunity to educate the public generally in the vocabulary and project-based pedagogy of architecture. Because open enrollment institutions are typically more representative of the actual community population which they serve, there is an opportunity to teach and advise a wide array of students. In fact, often, the only unifying element among students at these schools is their interest in the selected subject matter. This natural diversity is desirable but does not necessarily lend itself to success with many of the current curricular protocols in architecture school which rely on a more homogenously-prepared university student body. The challenge here is determining how to teach the rigor, tools, and discipline required for the iterative, critical, and self-critical process that is involved in the architectural design studio.

Realistically, just as with any other discipline, some students will demonstrate a higher natural ability, aptitude, and work ethic for architecture than others. The question becomes: can anyone and everyone interested in architecture learn to be an architect? It is this pointed question that often prevents architecture as a discipline from making progress toward becoming more inclusive. Some in the profession or architectural academy may believe that there are already enough talented students in architecture school, so there is no need to open up admissions to even more students, potentially 'diluting' the current talent pool. This idea is unfortunate. Segregating a knowledge base and hoarding educational opportunity for specific classes of people has historically left more people out and resulted in poorer societal outcomes. In institutional structures such as architectural education where change is slow to occur, often it is because someone is benefitting from the status quo. So, in architecture, and especially in architectural education, who benefits from the system staying the same? It may be that the institutions themselves are the beneficiaries, perhaps because there is motivation to maintain standards, rankings, and pedagogical traditions and systems (Ahrentzen and Anthony, 1993, p. 19). These traditions may act as barriers for some students unintentionally. The current system of architectural education might work against efforts for greater diversity in the student population, also unintentionally, by isolating architectural instruction to a small subset of students who have been admitted to architectural programs in the name of standards. If the premise of diversity is not accepted as a priority, then there will be great difficulty in making any significant progress. Architecture as a discipline must be made normative - and not rarer - through its introduction at open enrollment schools. Some in

the architectural community enjoy benefits of the rareness, but it is problematic because it is exclusionary.

Greater inclusion in and expansion of architectural education can serve dual purposes. The first is to increase the avenues to and through an architectural education with eventual opportunities for professional degree attainment and architectural licensure. This includes pathways from open enrollment institutions such as community colleges to university architecture programs via transfer to provide increased opportunity for those students who were not admitted to university architecture schools as incoming college freshmen (Dowd and Melguizo, 2008, p. 380). As a professor at Austin Community College for several years, I have taught and advised architectural students who displayed the ability, desire, and motivation to attend architecture school and potentially succeed within the profession. But because of various financial, logistical, familial or cultural circumstances, many of these students did not previously have a clear pathway to be able to attend a university architecture program. When transfer is possible from a community college architecture program to a university program offering professional architecture degrees, it is open enrollment architecture courses, such as are offered at community colleges like my own, which provide the gateway to expanded opportunities and future advancement in architecture.

The success of these course offerings should not rest, however, on whether all of the students taking them become architects. For the other major goal of expanding access to architectural education is to broadly educate the public about architecture as a phenomenon, as well as a possible future course of study for themselves. Courses in

architecture, and specifically architectural design, should be more widely accessible so that students have not only the earliest possible opportunity to determine if architecture is something they have an aptitude for or would like to pursue, but also a general appreciation and understanding of the built environment. When more people speak the conceptual language of architecture, society will be more conversant about its shared, collective environment, and demand better. Instead of select architects designing a few buildings for a limited segment of the population, a more diverse architecture profession, with architects representing a range of backgrounds and interests would, therefore, be interested in addressing a broader range of projects and contributing to the character of our shared communities and its built environment (Groat and Ahrentzen, 1996, p. 166).

Architecture faces pressing issues that ultimately will determine its appeal as both a field of study and a profession. Architects are generalists, but the majority of credits, coursework, and cultural emphasis in architectural education is focused on studio and design. It is in this way that architects can be too narrowly educated, but this can be remedied by incorporating more interdisciplinary ideas about the ways in which creativity is taught in architectural studio courses. In fact, portfolio submission and student selection based on portfolio review heightens the importance of design and creativity within the architectural curriculum and the need to provide interested students with design skills.

Historically, architectural design pedagogy has relied on the "charrette" method of teaching. This method relies on a journey of self-discovery, wherein the design problem given is intended, itself, to be the teacher. The trouble is, instruction in this

method can be inherently discriminatory: for by its nature, it may exclude or discourage students lacking experience with independent, project-based learning, or discomfort with the accompanying design jury criticism, not to mention lack familiarity with the very building *type* as the problem (Goldschmidt et al., 2014, p. 13). Perhaps more disruptive ideas are necessary for educating a wider variety of students. Looking to alternative teaching methods for architectural design, including those methods that offer more structured feedback along the way for students with different styles of learning, is necessary in order to educate a more diverse cohort of future architects.

Providing identical instruction to all students may promote equality in that everyone is receiving the same information, but this method is effective only when the structure of the institution provides support for the architectural curricula and students are consistently prepared and fairly selected through an academic admissions process. At the community college level especially, exploring multiple methods of teaching architectural design, and its contributory components of creativity, is critical to providing an equitable learning environment. It is through this exploration that the learning styles of the student and the educational milieu of the design studio may be more closely aligned.

The motivation for studying *creativity* as such is its role as a common factor and necessary element for all architectural projects (Casakin et al., 2010, p. 1). If creativity is accepted as central to architectural education and its implementation in the design studio, then developing creative potential in students can be viewed as a primary pedagogical goal, and successful strategies for inclusion would include enhancing abilities, such as creativity, which are applicable to all people.

Because creativity, as an ability, is not specific to architecture, the research surveyed and reported in this study takes an interdisciplinary approach to more fully explore the best strategies in identifying potential in design students and provide an educational environment that promotes student success. There is extensive research in the area of creativity and creative thinking as it pertains to human psychology and cognition, but there is far less academic research examining creativity and architectural design pedagogy. While this research does exist in some small measure for university programs, there appears to be a research gap or lacuna in the examination of design pedagogy at the open enrollment, community college level. In the effort to educate a broad range of students from various backgrounds and cultures, a focus on creativity can serve as a means to unify a population coming from different backgrounds and levels of experience. Knowing more about human creativity has the potential to act as a means of promoting equity in architectural education.

Students must pass through barriers: tests, assessments, exams, and reviews. This is probably as it should be. Certain methods of assessment, however, might create *unintended* barriers for those with an interest in or aptitude for design and architecture. Attempting to find a bridge, through creativity testing, that could bypass other institutional obstacles may seem disruptive to the current educational system, but the existence of alternative pathways into and through the profession is not a new concept in architecture. Formal architectural training with uniform and consistent requirements as the sole method of achieving architectural licensure is a relatively recent phenomenon. Architectural training had previously existed as a system of apprenticeship, and there was

a way to achieve licensure through a lengthy internship and without formal professional education. Now that this system has been slowly phased out and replaced by a more uniform system in the United States, there still need to be alternative educational pathways in order to serve and identify the best candidates from all sectors of the population.

One of the purposes of this research is to design an assessment of creativity as an exploratory study and test it with different types of student groups. The idea is to identify components of latent creativity in students who are likely to have success in architectural design but might be overlooked for admission to an architecture school. This research is designed to see whether assessing creativity, instead of other skills or knowledge, can serve as an equalizer in entering architectural education. Admissions guidelines for university architecture programs typically include grade reports, standardized test scores, and admissions essays as part of the application for admission. While these metrics are currently effective in selecting candidates for academic success, other instruments may provide additional insight into the capabilities of students as they specifically pertain to architecture and design. Assessing creative potential does not need to occur as a condition of admission to a university program, but more predictive information regarding creativity may prove useful to the faculty and administration at open enrollment institutions or secondary schools. This predictive data can fill a void where other measures of past student performance are not available and can be used to best serve the needs of a diverse student body (Levin et al., 2017, p. 121).

Creativity should be normalized in society, but especially in education, as it is a subject that is able to be taught to students of any age. Providing the circumstances in which students are most creative, and are therefore able to have the best chance at achieving success in architecture, is paramount to envisioning a more diverse population entering into and becoming the future face of the profession.

In sum, awareness of architecture's problem with diversity is not new, but architectural education and the profession are at a point where concrete, if different, solutions and initiatives are necessary. Many architectural educators are committed to this endeavor as evidenced by the following interview given by Milton Curry, architecture dean of the University of Southern California, to the *Los Angeles Times* in 2017. In it, the interviewer stated:

> Curry told me his central goal at USC is to educate a new generation of "citizen architects" capable of shaping not just buildings but civic life. He also said that bringing diversity to the ranks of architecture students has to do with more than just race; he said he wants to encourage a range of "students who may not have considered architecture. It's more than identifying talent. It's about cultivating potential. We have to provide the pathway for those students—not only underrepresented minorities but lower-income students, students from rural areas" (Hawthorne).

Curry touches on a point here that is often overlooked when discussing diversity within architectural education. There are visible metrics of diversity such as race and gender, but there also less visible ones such as culture, class, and socioeconomic status (SES). Additionally, inclusive policies in architectural admission and education require an understanding that students and potential future students do not fit precisely into

individual categories of diversity, but are complex individuals bringing their own range of experience to the educational setting.

The focus of this thesis is to examine the aforementioned themes of education *broadly* and also how they manifest themselves *specifically* within the discipline of architecture. As a community college architecture professor, I am invested in exploring the methods by which the main stakeholders in education, primarily faculty and students, relate to and with one another in order to develop creative design skills in students of architecture. The hope is that possibilities exist for expanding the pathways into the architectural profession with the inclusion of student communities currently underrepresented within the architectural community. However, the broader impact of this research is to benefit participants currently within the architectural education community who can learn from students with diverse backgrounds and varying points of view. The most specific product of this research is a tested creativity assessment tool, one that could potentially provide educators with predictive, supplemental information regarding students' creative capabilities in order to tailor curriculum to provide the greatest opportunity for success in project-based, foundational courses in architectural design.

# Chapter 2: Creativity in Context: *Theory and Precedent*

In the introduction to his book *Creativity: Progress and Potential*, Calvin W. Taylor (1964) wrote that "Man's current degree of enlightenment, particularly in certain fields, as well as his vast production of material goods, can be traced in large part to the creative performances of individuals during the course of history" (p. 2). Since the publication of this statement in the mid-twentieth century, creativity research has proliferated and expanded its scope of analysis with regard to human potential. And yet, while research on creativity has been conducted in a variety of academic fields, its findings tend to remain confined to the field of the original research. Understanding how "creativity" has been defined and studied reveals the need for an interdisciplinary approach to its applications to architectural education.

## ETYMOLOGY OF "CREATIVITY"

The phenomenon of human creativity has long held a position of fascination and curiosity for academic researchers regardless of the term used to describe it. Despite its definition and interpretation changing over time, the origins of the word *creativity* are rooted in Western tradition. It is defined broadly as "the ability to produce new knowledge" (Dacey et al., 1998, p. 3) and, more specifically, by creativity theorists as "the ability to produce work that is novel (i.e., original, unexpected), high in quality, and appropriate (i.e., useful, meets task constraints)" (Sternberg, Kaufman, & Pretz, 2002, p.

1). Other current interpretations of the word conjure images of individual originality, described as:

> The trait or ability which enables a person to put forward ideas, or execute and produce works of imagination, having an appearance of novelty, which are immediately or in due course accepted by experts and peers as genuine contributions having social value (Eysenck, 1995, p. 83).

The word *creativity* first appeared in George Lawson's text *Theo-Politica* with the passage "In Creation, we have God and his Creativity (as Occam and Bacon expresse it) and the thing created" (OED Online, 2018). The word *creativity* is derived from the word *creative*, taken from the French *creatif*, whose modifiers are consistent with the English language word modification process of forming adjectives from abstract nouns by adding the suffix *–ity* meaning "state, condition, or quality of being" (Barnhart, 1995). This suffix is derived from the Middle English *–ite* and the Old French *–ite* which are both taken from the Latin suffixes *–itas* and *–itatem* (OED Online, 2018). The word *creative* first appeared in literature with the Early Modern English spelling *creatiue* in the year 1490 in John Ireland's (Johannes de Irlandia) *The Meroure of Wysdome* (Gosman, 2005, p.155). This 16th century text from the English Renaissance, the earliest surviving work of Scots prose, features the word in the following passage: "Infinit perfeccioun in him the power creatiue ["Infinite perfection in him the power creative"] (Irlande et al., 1990). Here, similar to the first use of the word *creativity* in Lawson's *Theo-Politica* referenced above, the excerpt from theologian John Ireland is referring to creation by God in the Christian tradition of honoring or praising divinity without any inference of individuation or personal creative ability.

Tracing the etymological roots of the words *create* and *creation* reveals the context in which language was used to chronicle the process of creation. The English word *create* traces its origins to the Latin root *creatus*, the past passive participle derivative of the Latin verb *creare*, meaning to "bring forth" or "form out of nothing" (Onions, 1979, p. 226). The practical use of the Latin *creare* included its adoption and use in the Roman world that predates Christian implications of divinity, hence the word *creare* was applied to Roman objects and ideas that were human-made. Latin root words stem from the Indo-European language family which is the most widespread of all language families and has produced the building blocks of much of the Western language tradition including the Germanic (Anglo-Saxon), Romance, Greek, and Latin languages. The Latin *creare* can be traced to the Proto-Indo-European (PIE) root *ker VI*, meaning "grow" (Shipley, 1984, p. 179). Since "grow" suggests that an entity already exists, the Indo-European meaning, predating the Latin one, refers not to original creation but instead infers cultivation or caretaking of an existing entity. This demonstrates that the transformation of the intent of the English word *create* - to mean that something is made from nothing - is a construct from Latin usage. However, even though the words *create* and *creation* share the same PIE root *ker VI,* "to grow," the English adjective *creative* is derived from an entirely different PIE root *kreu*, meaning "flesh" (Shipley, 1984, p. 194, 489). And although "flesh" may appear to be only indirectly linked to *creative* or *creativity*, the Latin word created from the root *kreu* translates as "first" (Shipley, 1984, p. 194) which is more indicative of the meaning of originality intended by the use of the word *creative*.

Creativity as a specific term to describe the process of ideation pertaining to original thought is a relatively recent one. In antiquity, the concept of creativity was often conflated with derivations of divine inspiration. The provenance of artistic ideas was attributed to one or more divine sources in that "all novel ideas originated with the gods" with *inspirare*, the Latin root of the word *inspire*, loosely translating as "to breathe into," as if a divine source were literally breathing the life of ideas into a mortal human. In contemporary writings of creativity, this view is now known as the 'messenger of God' theory. The messenger of God theory posits that ideas are deposited into one's mind by a form of deity:

> The creative person suddenly begins to produce something complete without knowing where it is coming from. This view has come down to us at least from the Greeks, who believed that the gods or the Muses breathed creative ideas into the artist (Weisberg, 1986, p. 1).

In ancient Greece, Plato reinforced this perspective by arguing that the poet was "possessed by divine inspiration," (Sawyer, 2006, p. 12) inferring that mankind acts in response to ideas received from a Muse or other immortal being instead of him- or her-self. The Greek philosopher Aristotle, who sought to further human understanding in many arenas of knowledge, began to shift from a strict 'messenger of God' interpretation of thinking. His analysis of imagination in relation to the objective existence of perception, physical sensation, and judgment started to separate imagination as a mechanism that might be connected to some form of personal control. In his text *De Anima (On the Soul)*, Aristotle described imagination as a functional necessity of human

creativity. He writes of the fact that humans distinguish themselves from animals and other organisms by thinking of things that do not exist in reality:

> For imagination is different from either perceiving or discursive thinking, though it is not found without sensation, or judgement without it. That this activity is not the same kind of thinking as judgement is obvious. For imagining lies within our own power whenever we wish…If actual imagination and actual sensation were the same, imagination would be found in all the brutes: this is held not to be the case; e.g. it is not found in ants or bees or grubs (Aristotle and McKeon, 1941, p. 587).

This intangible "something different" that Aristotle refers to is the essence of inspiration as there must be awareness of this type of thinking in order to be receptive to ideation, regardless of the source of those ideas.

As thinking transferred from ideas of *inspiration* to *intuition*, shifting views and competing philosophies emerged as to the source of original ideas. The idea of *inspiration* infers that ideas stem from another source such as a deity, but the concept of *intuition* infers that humans are more reliant on the self for conceptualization. Other scholars would go on to pursue insight into methods of reasoning which emphasized various viewpoints and theories of mind in human psychology. The thinker Rene Descartes promoted the idea of intuition along with human deduction in the course of his writings regarding experimentation in mathematics and the sciences. His formulations formed the basis of the theories of Rationalism, and he wrote in 1648 of the idea of "innate ideas" formed in the human mind. Descartes expands on this view:

> I observed, however, that there were in myself certain thoughts (*cogitationes*) that did not proceed from external objects, nor from a determination of my will, but only from the thinking faculty that is in me; and therefore, in order to distinguish the ideas or notions that are the content (*formae*) of these thoughts from other

> ideas which are *adventitious* or *manufactured*, I called them *innate* (Descartes et al., 1954, p. 302).

Rational theories, including those of Descartes, would set the stage for ideas of creative thinking and modern innovation as applied to problem solving.

In a competing view, the philosopher John Locke argued that humans are born knowing nothing, that the mind is a blank slate or "tabula rasa" at the outset, and that knowledge can only be gained through sensory experiential learning. This school of thought, known as Empiricism, remains at the heart of the scientific method for testing behavioral data in later psychological studies and other scientific endeavors. The Scottish philosopher David Hume built on Locke's earlier ideas, promoting the argument that all human knowledge can be divided into two categories: 1) relations of ideas and 2) matters of fact. The impact of Hume's Empiricist beliefs have been made increasingly evident through the surge of discoveries that use Hume's distinction in the twentieth century in the field of psychology, testing both for intelligence and creativity.

The word *creativity* is accompanied by many other terms to describe high-level psychological function. Previous descriptive words have indicated potential for progress within *creativity*, but the word *genius* infers that knowledge is somehow predetermined for a person based on innate intellect. However, prior to the more prolific use of the word *creativity*, *genius* was used predominantly in the research literature to indicate a measure of intellectual ability. The idea of genius is also predicated on the psychological belief that humans are not born with the same intellectual capacity. Although this view may seem harsh in that it prejudges ability, it actually coincides with the belief that

human cognition is subject to individual differences. Robert Weisberg writes in his 1986 book *Creativity: Genius and Other Myths*, "Creative individuals are assumed to possess extraordinary personality characteristics which also play a role in bringing about creative leaps" (Weisberg, 1986, p. 1). The genius view, now debunked, is elitist in the sense that most would assume that *they* did not fit the description of a genius, or worse, that others could prejudge this potential for them. As seen below in Figure 2.1, use of the term *genius* peaked in use in the latter part of the eighteenth century, and the word *creativity* did not come into wide use until the middle part of the twentieth century.


Figure 2.1: Word Use of *Genius* and *Creativity* from 1700 to the present day

That it hasn't always been called creativity, doesn't mean that "it" – be it imagination, intuition, inventiveness, originality, or ingenuity – hasn't existed previously. Indeed, creativity may be called something different in the future.

## THE NATURE OF HUMAN CREATIVITY

Modern creativity research, beginning in the twentieth century, vaulted causal issues of originality into the mainstream of psychological research while revealing shortcomings of previous theories of ideation. This work remains relevant today as contemporary creativity theorists have built on these core tenets of early findings and theories in psychology and creativity. Prior to formalized theories of creativity, thinkers in other fields of study began linking ideation to earlier ideas, such as those of Aristotle, of tapping into one's own subconscious or unconscious state of being to reveal creative ideas.

The French mathematician and philosopher Henri Poincare examined the nature of the unconscious as means of informing independent thought. Reflecting in 1908 on an earlier experience with his own incubation of an idea, he recounted the phenomenon of what would later come to be identified by creativity theorists as Unconscious Incubation (Weisberg, 1986, p. 23). The theory of Unconscious Incubation identifies a period of downtime that the mind often goes through before revealing a new concept or solution to a problem. This idea was contrary to widely held beliefs at the time that, in order to achieve a mental connection, one needed to be actively engaged in pursuing that topic of knowledge in order to think of a related outcome. In Poincare's case, his quest to further his understanding of specific high-level mathematical functions had led him to habitually study math theorems daily, but he was stymied by the problems and unable to make a breakthrough. In a now well-known retelling, Poincare drank coffee before going to bed and could not sleep (Toulouse, 1910). As a result of his sleepless night, new insights

regarding his mathematical dilemma came to the forefront of his mind. He wrote about his experience, "Ideas rose in crowds; I felt them collide until pairs interlocked, so to speak, making a stable combination [of mathematical functions]." He would later go on to write out and clarify his thoughts on the concept of Unconscious Ideation since it had proven so valuable to his work in mathematics and physics. Henri Poincare described a process of ingesting information, then allowing the mind's unconscious processes to work freely:

> To invent, I have said, is to choose; but the word is perhaps not wholly exact. It makes one think of a purchaser before whom are displayed a large number of samples, and who examines them, one after the other, to make a choice. Here the samples would be so numerous that a whole lifetime would not suffice to examine them. This is not the actual state of things. The sterile combinations do not even present themselves to the mind of the inventor. Never in the field of his unconsciousness do combinations appear that are not really useful, except some that he rejects but which have to some extent the characteristics of useful combinations (Eysenck quoting Poincare, 1995, p. 173-174).

Eysenck notes here that Poincare's mental exercise will not actually produce ideas that aren't useful, but it is up to the person in a conscious state to use those ideas in a manner that fits with a current problem. Critics of Poincare dismissed his postulating about a somewhat unremarkable experience with a common mental occurrence regarding the process of idea formation. But it is the commonality of the occurrence that was relatable and caused psychologists and theorists to adopt the premise of incubation, then apply it to higher-order mental processes. The publication of Poincare's experience was also widely circulated and had a far-reaching impact across a variety of academic domains.

The Austrian physician and psychologist Sigmund Freud theorized about unconscious processes, thoughts, and their accompanying behaviors. In his essay titled

*The Relation of the Poet to Day-Dreaming*, Freud described the process of tapping into one's own unconscious processes and imaginative activity for a specific creative purpose. To illustrate his theory, Freud outlined the procedures a writer undergoes when mining the depths of their own psyche to produce a creative, written work. He outlined that a writer analyzes three periods of time; namely the present, past, and future in which to convey the totality of their observations. But in addition to simply documenting personal events, the writer uses the process of creation as a means of therapeutic reflection upon past events and to rectify a previously unresolved conflict:

> Some actual experience which made a strong impression on the writer had stirred up a memory of an earlier experience, generally belonging to childhood, which then arouses a wish that finds a fulfilment in the work in question, and in which elements of the recent event and the old memory should be discernible (Freud, 1908, p. 52).

Freud later expanded his view of this process as a "working-through of the resistances," noting that only after a conflict is identified and a person is made aware of it can one properly and patiently begin the "arduous task" of attending to "the work which affects the greatest changes in the patient" (Freud, 1911). It is this form of intrapsychic catharsis and transference at the heart of creative exploration. Although writing is the medium Freud was describing, others in disciplines including art, science, math, and architecture are able to work through Freud's 'arduous task' of examining and translating experience into resulting works that could be unique in their ability to convey originality, culminating in an end product of an introspective and authentic process.

The idea of the unconscious as an instigator in the creative process is one that was embraced by the American educator and philosopher John Dewey. In his 1922 book

*Human Nature and Conduct: An Introduction to Social Psychology*, Dewey crafted insight into the nature of human potential. Dewey's writings were critical in the timeline of creativity research in that he argued that humans are able to learn how to construct their own new, and creative, ideas. Many prior thinkers on the subject had promoted the idea that one had to be born creative or had to be genetically predisposed to thinking or acting in a creative manner. Dewey described this phenomenon in 1916 as "immaturity" in a positive sense, in that he is not referring to the absence of maturity, but the innate potential to develop ability (Isaksen, 1993, p. 3). This idea demonstrates that not only can creativity be learned but that it is also teachable. In one particularly revealing passage from *Human Nature and Conduct*, Dewey makes the distinction between instinct and impulse:

> The use of the words instinct and impulse as practical equivalents is intentional, even though it may grieve critical readers. The word instinct taken alone is still too laden with the older notion that an instinct is always definitely organized and adapted—which for the most part is just what it is not in human beings. The word impulse suggests something primitive, yet loose, undirected, initial. Man can progress as beasts cannot, precisely because he has so many 'instincts' that they cut across one another, so that most serviceable actions must be learned. In learning habits it is possible for man to learn the habit of learning. Then betterment becomes a conscious principle of life (Levitt, 1960, p. 139).

Dewey's leanings as a writer show how his work would eventually influence that of later psychologists looking to seek evidence for creativity to be discoverable and learned instead of an innate function. This proves to be an equalizer with regard to creativity since this concept does not preclude those of a perceived underprivileged group or class from creative achievement.

Among a group of French thinkers that emerged at the end of the nineteenth century was a psychologist named Theodule Ribot who had been trained in abnormal psychology, specifically identifying mental disorders and their causal derivations. At the end of the nineteenth century, the French government had passed a law mandating that all six-to-fourteen-year-old children be required to attend school. Due to this law and the need to research proper methods for educating and identifying capabilities in this new cohort of schoolchildren, the Education Ministry of France commissioned several psychologists, including Ribot and his colleagues, to explore the nature of various psychological perspectives including creative capability. With the publication in 1900 of Ribot's treatise on creativity titled *Essai sur l'imagination créatrice*, originally published in his native French and translated into English in 1906 as *Essay on the Creative Imagination*, Ribot contributed to vaulting creativity forward as a legitimate area of academic study specific to psychology, yet independent from philosophy and spirituality. Ribot's contribution to the study of creativity is significant in that it focused on the nature of creativity and its exploration of how the mind operated in creative exercises.

Ribot looked at the nature of both objective and subjective qualities of judgment when considering ideas from a psychological perspective, and combined these with psychological tenets of intelligence and cognitive development that had been widely accepted up to this point. Ribot described this combination of logic mixed with sentiment as "logic of the feelings" (Gunn, 1924). Here he delineated what he viewed as the difference between natural human feelings of ideation as opposed to logic only, which might manifest itself as strict intelligence. Ribot explored issues of creativity,

specifically, in *Essay on the Creative Imagination*. One of the issues that he explores as a methodology for creative thinking is the use of analogy:

> The psychological mechanism of the creative moment is very simple. It depends on a single factor previously studied — thinking by analogy. It is a matter first of all — and this is important — of conceiving beings analogous to ourselves, cast in our mould, cut after our pattern; that is, feeling and acting; then qualifying them and determining them according to the attributes of our own nature. But the logic of images, very different from that of reason, concludes an objective resemblance; it regards as alike, what seem alike; it attributes to an internal linking of images, the validity of an objective connection between things (Ribot, 1906).

This description of using analogical reasoning as a mechanism for creativity is still widely accepted as a methodology for learning a creative discipline, especially in the field of architecture (Gentner, Holyoak & Kokinov, 2001). The impact of Ribot's essay on creativity in both intellectual circles and within the study of what was then known as abnormal psychology was immense in that it influenced the breadth of creativity research that would take place in the twentieth century.

Another French researcher working at the turn of the century was a contemporary of Ribot's named Alfred Binet. Binet was formally trained as a lawyer but was interested in the machinations of human intelligence and began working to develop a test that would measure mental capability. He came to the conclusion through his research that intelligence could and should be tested in order to determine potential for intellectual capacity and human reasoning. In 1904 he was commissioned by the French government and the French Ministry of Education to formally develop his ideas into a measurable scale that would be predictive for intelligence. Although Binet did discuss creative behavior in his findings, he did not include or develop a specific test for creative thinking

and creative reasoning. He was instead focused on mental development and looking at the ways in which childhood mental behavior influenced later metrics of adult intelligence (Gunn, 1924, p. 2). In his book *L'Etude experimentale de l'intelligence (Experimental Studies of Intelligence)* published in 1903, his text outlined the methods he and his research assistant Victor Henri used to identify potential learning disabilities. One of the testing methods that Binet had been using with young children in mental experiments to identify more expansive, and later labeled as creative, thinking was the inkblot test. A test subject would be shown a smattering of ink on a piece of paper and derive some imaginative, explanatory description of its origins or motivation. Some of Binet's American counterparts were also working on methods of mental testing, and the inkblot test was being used in 1900 by the researcher Edwin Kirkpatrick.

While the inkblot test provided inconclusive and less reliable results in many cases, Binet continued to work on types of intelligence test questions with his assistant Theodore Simon. Binet and Simon developed a system of assessment for intelligence with a scale that would come to be known as the 'Binet-Simon Scale' and contained measurable outcomes with specific exercises. Research subjects would be graded on the metrics of the scale that he created in order to standardize the results of the testing:

> Binet created a group of simple tests of memory and reasoning. By 1910 he had begun to use these tests to make an important breakthrough: to take into account that a child's knowledge steadily changes and increases with age. He tested large numbers of children and determined how the average child performed on his tests at progressively older ages. That average for each age was the "mental age." He could then create a measure of intelligence, the "intelligence quotient" or IQ, by relating mental age, as measured by his test, to actual chronological age by using a ratio (Andreasen, 2005, p. 9).

Binet's focus was primarily on studying school children, and the impetus for his interest in intelligence testing was to predict whether children would do well in school. His testing was effective and became widely adopted because it was tested with a large data set of children and the results had proven to be predictive. Even without longitudinal study data, educators at the time were able to see the effectiveness of the test within a relatively short time period. Contemporary creativity theorist Robert Weisberg noted of Binet's tests:

> The success of the tests was relatively easy to determine: One had only to look at how well the tests differentiated children who performed well in school from those who performed poorly. The reason Binet's test was adopted was that it was possible to determine that is was successful. That is, the test demonstrated criterion validity (Weisberg, 2006, p. 476).

The impact of Binet's findings were far-reaching with the pervasiveness of IQ testing of school children and adults both in Europe and in the United States continuing well into the twentieth century, as the test was considered a standard for predictive success in early childhood, elementary and secondary education. This system of intelligence testing laid the groundwork for later development in creativity testing with its inclusion of theoretical bases, variety of question types, and standardized grading rubrics in the testing materials.

Binet's influence was felt in the psychological community, and an American researcher name Lewis Terman took up the cause of intelligence testing. In the early part of the twentieth century, Terman was a prominent researcher at Stanford University who had used his own intelligence test to challenge a widely-held belief at the time that a precocious, intelligent child was abnormal. Many people believed a child who displayed intellectually gifted tendencies while young would experience intellectual decline in

adulthood and described this phenomenon as "Early ripe, early rotten" (Andreasen, 2005, p. 9). Because of his own experience as a gifted child, Terman was interested in ideas of innate creativity and genius and would go on to supplement and further develop the Binet-Simon Scale. After testing his adapted version of the 'IQ' assessment on over 1,000 subjects, Terman published his findings in 1916 in *The Measurement of Intelligence,* renaming this newly-adapted test scale as the Stanford-Binet scale, named for the location of his research lab (Andreasen, 2005, p. 10). Terman was motivated to create specific measures for intelligence that could be utilized in longitudinal studies of predictive outcomes of adult behavior and intelligence as tested in children.

Terman would later go on to describe and label various levels of intelligence and revisit the idea of what it meant to be a genius. His goal was to scientifically define genius and specifically look at giftedness and intelligence with their corresponding measurements on intelligence tests. He noted in his paper 'Psychological Approaches to the Biography of Genius' that "the sine qua non [the essential condition] of genius is the ability to acquire and to manipulate concepts, the shorthand symbols without which abstract thinking cannot proceed" (Terman, 1947, p. 3; Vernon, 1970, p. 25). Terman also looked at case study examples of subjects who tested well in some areas of intelligence but not in others. By the time he was writing about psychological approaches to the study of genius in 1947, he had already obtained large amounts of longitudinal data through test results to observe significant results. And although Terman's findings would later become controversial in that the testing data could be used as a means of discrimination based on assessment of mental capacity among groups of

people with mental limitations or disorders, he provided the most accurate assessment of intelligence testing available. Furthermore, researchers from his original lab at Stanford followed their original cohort of 'genius children' for over seventy years. His contribution to the arena of creativity research was the differentiation between testing for intelligence and testing for creativity, noting that these are completely separate domains in terms of identification in potential test subjects.

In 1926 a psychologist named Graham Wallas published a book called *The Art of Thought* wherein he laid out a procedural process for how humans think and, specifically, how they engage in creative problem-solving. This seminal work would go on to influence thinkers in creativity well after its publication but also provide a label for earlier researchers' descriptions of their experiences, either personally with a specific thought process or their observations of others, engaged in creative works. For example, Henri Poincare's description of Unconscious Incubation at work in solving his math problem could be able to be dissected and broken down into identifiable steps. In Wallas' view, a creativity system was necessary so that it could potentially be recreated by someone, or one could identify their own specific creative method of problem-solving. This would then allow a person to apply a systematized approach to complex problems in a variety of domains including science, and as we will see in later research, architecture.

Graham Wallas analyzed creativity and determined it to be a process, then created a systematic method of looking at the steps by which one can be creative. He noted:

> Men, as I argued in my Art of Thought (1926), can by an effort of will "think out" a situation. They can hold their attention on it; make themselves conscious of steps in the process of reasoning of which they would otherwise be unaware; and

> direct and verify their inferences by artificial rules of logic or science. Feeling, taken by itself, is at present much less under our voluntary control than reasoning. It is much more difficult for us by an effort of will to "feel out" than to "think out" a situation (Wallas, 1935, p. 43-44).

Wallas outlined his creative process in 1926 which included four main stages of creativity, and gleaned the bulk of his research from the case study method. For these specific case studies, Wallas looked at creative people and analyzed their thought processes, methodologies, activities, and the results of their process. The other analytical method that Wallace used was to examine empirical studies of creativity and behavioral methodologies. The first step that he described in the process was labeled as Preparation. This specific preparation could involve any form of planning, study, or research that is involved in a creative endeavor. The second stage is what Wallas described as the "fore-conscious" or "fore- voluntary" mental processes involved in Incubation. This is not unlike *unconscious incubation* as discussed earlier with reference to Poincare. The difference here is that the preparation has already occurred, and this stage involves allowing the information to distill in the mind so that connections can be made mentally later on. This may sound familiar as many creative people have described using this technique of incubation, but at the time, this was a novel concept to be able to identify and clarify exactly what was taking place in the process of creativity. The third step in Wallas' process of creativity is Illumination. This stage of the process involves combining all of the mental facts and processes that were gathered in the first step and allowing them to distill and make connections to be revealed in the Illumination stage. Wallas notes that Illumination is not a part of the process that can be rushed or forced.

He also refers to this stage as a “culmination--so it is a result of mental work that has gone before, whether conscious or unconscious” (Wallas, 1926, p. 79-96). The last stage of the process is known as Verification. This step is a controlled process that is deliberate in that it is something that you consciously undertake, not unlike the first stage, wherein you are gathering information and preparing. This stage involves testing the ideas that were received through the process of the other steps. The impact of Wallas' findings on creativity were far-reaching and are still felt in popular culture today. In fact, there are many popular psychology books, websites, and other materials that still use some form of this four-step process which Wallas had tied to his own research and theoretical roots (Vernon, 1970, p. 91-97).

## ASSESSING CREATIVITY

After analyzing several factors of human intelligence at the beginning of the twentieth century, researchers began to establish differentiating factors between intelligence and creativity. In examining both the structure of intelligence testing and its resulting research and influence on popular culture, most theorists agreed by the middle part of the twentieth century that the root causes of intelligence and creativity were not the same. Therefore, the methods by which both of these domains - creativity and intelligence - should not be tested in an identical manner. In looking at creativity specifically, researchers as a group began to accept that creativity could be learned and was not a native or innate trait:

> Although many psychologists believe that creative thinking depends on specific thought processes, they also believe that those processes can be carried out to

> some degree by all of us. Those who produce great creative advances might be *better* creative thinkers, but the same thought processes are available to or present in all of us. Similarly, if there is a specific set of personality characteristics that are related to creative achievement, those characteristics are assumed to be present to some degree in many if not all of us; they are simply present to a higher degree in those who produce great creative achievement (Weisberg, 2006, p. 5).

If creativity can be learned, then it must stand to reason that it could be taught, tested for, and assessed. Upon establishing that creativity indeed existed within its own domain, researchers began to separate out various components of creativity looking at different aspects of creative behavior and creative thinking to determine if those could be developed, assessed, and measured separately.

The surge in research in human intelligence heavily influenced the exploration of creativity research and the interest in testing for creativity, and this cause was taken up by a researcher named H.L. Hargreaves. In 1927, Hargreaves published a study on what he referred to as the "Faculty of Imagination" (Furnham et al., 2007, p. 1068). Hargreaves did not label this process as creativity testing here, but it ushered in a period of research in the 1930's and 1940's addressing domain differences, focusing on the differentiating factors between intelligence and creativity whose characteristics, up until this point, had been conflated with one another. Hargreaves first identified a factor in creativity testing known as *fluency* which delineates the number of imaginative responses for a given test prompt (Eysenck, 1995, p. 84). This research also served as a precursor to later, sophisticated processing involved in creativity testing:

> As with preschool, elementary school, and high school subjects, studies involving college and adult subjects have shown uniformly rather low relationships between measures of creative ability and measures of intelligence and scholastic aptitude. In general, the findings reported by Hargreaves in 1927 have continued to be

> supported. When he scored his tests of imagination for fluency of ideas, with emphasis on quantity rather than quality, he obtained fairly high correlation with intelligence tests (Torrance, 1965, p. 32).

Hargreaves' research influenced Charles Spearman who developed a method for showing correlations between tests of intelligence and what he termed *divergent ability*. This quality is in contrast to *convergent* ability which is the ability to give specific answers to specific questions. Divergent tasks provided a means for testing topics of an open-ended nature and would gauge a person's level of innate creativity, even though Spearman wasn't labeling it as creativity testing at the time. Spearman outlined his views of the creative process in three principles in 1931. His three creativity principles were titled: 1) the Principle of Experience – a person's feelings, 2) the Principle of Relations – a person's perceptions of how ideas are related, and 3) the Principle of Correlates – a person's method of generating a new option related to ideas already presented (Glover et al., 1989, p. 5-6).

The rise in the use of the term *creativity* around 1950 and the proliferation of creativity testing can be traced, in large part, to the work of J.P. Guilford. The Empiricist approach of earlier thinkers had influenced J.P. Guilford in his 1949 address to a meeting of the American Psychological Association and its subsequent publication in 1950 in the magazine *American Psychologist* looking at the origins and nature of creativity. His resulting *Structure of Intellect Model* established landmark standards and hallmark truths in the field of human creativity, solidifying its place within the psychological literature and furthered the discourse and current understanding of individual differences within

psychology. Guilford's impact on creativity research is described as a function of the types of thinking he was interested in investigating:

> J.P. Guilford argued that conventional concepts of intellectual ability focused too strongly on speed, accuracy, correctness, logic and similar properties, aspects of what he called 'convergent' thinking. These are very important, it is true, but should not be allowed to dominate the conceptualization of mental functioning at the expense of branching out, generating alternative answers, seeing possibilities and the like—aspects of what Guilford called 'divergent' thinking (Cropley, 2001, p. 1).

Because Guilford looked at the process and product of creativity, he was building on those who came before in the same area of interest. However, the likely reason Guilford's writings had such a wide impact at the time was due to the dearth of work in creativity assessment and individual differences earlier in the twentieth century. In his 1968 text *Intelligence, Creativity and their Educational Implications*, J.P. Guilford adamantly lays out his case for a new approach:

> The neglect of this subject by psychologists is appalling. The evidences of neglect are so obvious that I need not give proof. But the extent of the neglect I had not realized until recently. To obtain a more tangible idea of the situation, I examined the index of the *Psychological Abstracts* for each year since its origin. Of approximately 121,000 titles listed in the past 23 years, only 186 were indexed as definitely bearing on the subject of creativity. The topics under which such references are listed include creativity, imagination, originality, thinking, and tests in these areas (Guilford, 1968, p. 79).

It is this aspect of the creativity that is specific to Guilford's area of focus: testing latent ability with a concrete assessment designed specifically to test aspects of creativity instead of the existing intelligence tests at the time.

J.P. Guilford developed his creativity test known as *Alternative Uses Task* or *Guilford's Alternative Uses Task* in 1967 which was based theoretically on his Structure

of Intellect theoretical model for creativity. Guilford's explorations of creativity assessment were rooted in factorial research design using a test design method known as 'factor-analysis investigation' wherein various facets of creativity are analyzed through one or more question types. The Alternative Uses creativity test offered examples of common, identifiable objects such as a brick, newspaper or paperclip and asked test participants to write any and all other uses they could think of for the given object. The theoretical goal of the test was to derive a factor of *flexibility* from the answers, gauging how far test-takers would veer from the obvious, primary use of the given object. In addition to flexibility, other factors that Guilford's test model assessed include *originality*, *fluency*, and *elaboration* (Guilford, 1978, p. 87).

The foremost researcher in creativity testing and creativity analysis in education of the twentieth century was E. Paul Torrance. Torrance's method of testing for creativity is still the most widely used method of creativity testing today and is known as the Torrance Test for Creative Thinking or TTCT. There are variations of the Torrance test for school-age children and adults as well, and the center that bears Paul Torrance's name still operates a research institute and maintains and distributes access to Torrance testing materials and grading rubrics. Paul Torrance developed the Torrance Test by looking at different measurements of creativity where some other researchers looked at one or two individual focal points of creativity. Torrance constructed test tasks that would examine multiple facets of creative thinking with the goal of receiving scores and data that were broadly distributed over various domains within creativity. The original Torrance test tasks were grouped into question types and given category names such as the following:

1) Ask and Guess, 2) Just Suppose, 3) Repeated Closed Figures, 4) Figure Completion. In Torrance's view, the methodology for each question type was critical to evaluating the types of creativity for which the participant was being tested. The creativity components that Torrance evaluated were specific to the task rationale. Verbal tests were constructed so that both children and adults could be tested, and examination questions were worded so the results were not skewed based on a test-taker's prior levels of vocabulary or language skill. Likewise, figural tests or those that involve drawing were based only on the level of creativity demonstrated and not the level of drawing skill or prior experience with drawing that the test participant possessed. The test rationale and types of creativity facets that were tested are described by Torrance in his 1969 book *Creativity*. Each task is based on a rationale developed from some research finding concerning the nature of the creative process, the creative personality or the conditions necessary for creative achievement. The tasks are designed to involve as many different aspects of verbal creative functioning as possible. The majority of the tasks are evaluated for *fluency* - the number of different relevant ideas, *flexibility* - number of shifts in thinking or different categories of response, *originality* - number of statistically infrequent responses that show creative intellectual energy, and *elaboration* - number of different ideas used in working out the details of an idea.

## ARCHITECTURE AND CREATIVITY

While there are strong correlations between the practice of architecture and the causal factors of creativity, the profession of architecture rarely engages large scale

studies of methodologies of creativity within the profession. This is likely because architects deem creativity to be an integral part of everyday practice, and yet the creative thinking processes of architects remain a mystery to most of those outside of architectural education and the professional practice of architecture. Despite the level of meta-analysis with regard to the process of design in architecture, there is little available data studying the creative capabilities of established architects. Testing individuals who are already deemed to be creative to see what characteristics and capabilities they already possessed is common when researching using a case study approach (Andreasen, 2005, p. 13).

In the middle part of the twentieth century, researchers had begun looking at domain differences with regard to creativity. This process involved analyzing components of creativity to determine whether there were domain-specific characteristics that caused individuals to be creative or possess creative talent in a specific field or area of interest. Donald MacKinnon was a psychologist studying creativity who was interested in what motivated and caused creative people to engage in their particular creative arena. In 1949, he founded The Institute of Personality Assessment and Research, also known by the acronym IPAR, at the University of California-Berkeley. He worked for the U.S. government as a psychologist during World War II, screening potential candidates for work in the Secret Service. MacKinnon was interested in exploring aspects of psychology that were put on hold or not an imminent priority during the years of World War II. By 1950, at the forefront of many researchers' minds were various areas of creativity research that had expanded to include studying topics that could be a potentially positive cultural force for the expansion of technology and

innovation. At the time, creativity was still considered to be in the domain of art or in popular culture something as superfluous and had not yet been widely connected with the potential for furthering human knowledge the way that intelligence testing had. At the time, intelligence testing had pervaded many areas of business, government, and intelligence testing was being utilized in schools and administered to children and adults of all ages.

In an effort to normalize creativity and its accompanying testing, MacKinnon wanted to address a creative discipline and examine the experts in that field. News of the impending study had been widely publicized, and he had secured five years of funding sponsorship from the Rockefeller Foundation to run the study. Although he had no background in architecture, MacKinnon was contacted by members of the architectural community to select architecture as the creative field of interest. The resulting study invited a group of what were, deemed by committee to be, the most talented (all-male) architects working at the time including Louis Kahn, Richard Neutra, and Eero Saarinen. The architect study participants gathered at the IPAR facility at UC-Berkeley for a series of creativity tests to determine the nature and derivations of all the architects' creative capabilities (Serraino, 2016, p. 13).

Donald MacKinnon's original hypothesis theorized that the accomplished architects in the study would possess unique creative characteristics that imbued them with abilities that made them particularly creative in their specified domain: architecture. Initial reviews of the study lauded the findings as a success, especially by the architectural community. This is likely because it recorded and showcased creative

results for a grouping of architects across the same creative and cognitive tasks which was, and still remains, a rarity in the field of architecture. However, a more critical interpretation of MacKinnon's findings actually demonstrate that the architects did not possess any particular personality traits that could not be found in other groups. Thus, it seems possible that the traits that would make one a creative architect can be found in a variety of people and personality types (Weisberg, 1986, p. 77).

# Chapter 3: Architectural Education and Creativity: *The Design Studio*

Creativity is the common thread among architects and architecture students. Inventiveness or resourcefulness is a shared goal, at least in some cultures and societies, regardless of other diverse aspects of the population. However, the circumstances surrounding the process of creativity vary between architectural practice and architectural education, and there needs to be an understanding of the environment in which architecture, and its accompanying creativity, are learned and taught.

## CREATIVITY AS A PROCESS

Definitions of creativity, as of design, vary as to whether the focus should be on creativity as a *product* or creativity as a *process*. Creativity in architectural education occurs as a function of both process and product. However, since the process of creativity in architectural design is the essential component of both idea production and project-based problem solving, it is the focus of this examination.

Architects have been engaged in the creative process for centuries but tended to be more actively engaged in what was being done on the drawing boards than explaining what was being thought. Contemporary theorists describe the factors unique to the architectural design process like this: “Most studies on the design process in architecture show that it does not follow rigid rules. Designers do not apply universal methods and rarely externalize their thought process” (Kowaltowski, 2009, p. 455). Examination of

the components of the creative process specific to architecture could be beneficial to architecture students.

Certainly, repetition or cycling is a hallmark of the architectural design process. Where other creative processes may be more linear or systematized, architectural projects require an iterative, repetitive process. The design iterations involved require constant analysis, feedback, and reiteration in order to achieve incremental progress toward a more refined architectural solution. This process occurs in architectural practice and in architectural education. In architectural education, students are learning about their own ways of working while trying to identify how creativity manifests itself within the process (Runco, 2013). As a pedagogical tool, the cycle of the creative process acts as a teacher itself. In making physical components by hand, the haptic act of drawing and model-making instructs students regarding the craft of the project. As with playing a musical instrument, the repetition allows physical skills to increase.

There is a precedent in architecture for physical building as a generative tool. The physical design process can relate to the connection of people and communities to their own built environment. This doesn't have to be related to actual, physical construction at the community level, but the how-things-are-made question may be more closely related to how people perceive their own involvement in their surroundings. Increasing diversity in architectural education might start with casting design education as a way to empower students from under-represented communities in architecture to influence community spaces directly.

The practice of skills, common in architecture, is critical in other disciplines too, including the performing arts. Looking to other creative disciplines can provide insight into other creative processes. For example, to sharpen skills and stay "in shape," a designer needs to determine the architectural equivalent of practicing and improvisation. Exercising an ability or skill that doesn't need to result in anything such as sketching where the focus is on building the skill instead of making a product. Equivalent behavior might include a musician practicing scales or a golfer hitting golf balls at a driving range. Not everything made in the course of an architectural project needs to be used in order to be useful.

Looking to other disciplines where the final product is executed by someone other than the artist is helpful in comparisons to the practice of architecture and construction of buildings. The nature of choreography is similar in that it offers the creator the opportunity to express thought, feeling, and meaning through movement of the human body. The work may be performed for an audience by the choreographer, but it is typically performed by one or more dancers working at the choreographer's direction. The dancer and choreographer Twyla Tharp notes that the choreography may be impacted and revised at the stage where the dancers become involved. Tharp describes her way of working through the choreographic creation process with the dancers, especially if she challenges them and meets with some unexpected resistance:

> I…might have had a wrong idea, in how they (the dancers) "resist" or don't accomplish (or) accommodate that idea. I might learn something about what's a better approach and get an idea that I would never have had. I try to be as straight as I can be as early as I can be; there's no point in duplicity here. We all want the same thing or we don't. And if we don't, either we can get to a place where we

> can work together, or we can't. And so there is no point in trying to sustain something that's not going to work. That's called denial, and it's very costly and exhausting (Kamali, 2010).

Here Tharp is remarking on the collective, group process of 'working-through' with its inherent conflicts and resolutions. Because the choreographers are not necessarily the ones executing the production of the final work, there is a level of direction, navigation, leadership, and communication that is added to the responsibilities of the artist, much like the construction of an architectural project.

## TEACHING AND LEARNING CREATIVITY IN THE DESIGN STUDIO

In architectural education, the focus is teaching and learning architectural design. There are other subjects taught in the course of an architectural education, but the culmination and synthesis of all of the subjects resides in the project-based approach of the design studio. As a result, the design studio exists as a factory for the exploration of a student's ideas and the teaching that takes place through the process of designing multiple types and scales of projects. Often the teachers in the design studio become facilitators working to guide the students in the discovery of their own creative process. Typically, architectural faculty are trained as architects and not educators. While this is accepted standard pedagogical practice for architecture school, it can present challenges for both the teacher and the student. This is not a criticism of the training of architectural faculty, but it can create a relationship between teacher and student known as the 'mastery-mystery' syndrome:

> Although many students express strongly positive feelings about the relationships they develop in studio with professors, other students express deep frustration

> with the mastery-mystery syndrome. A female student from school C puts it this way: "I thought I had a pretty good notion of what a professional education was ... and that's to teach you how to be a responsible decision maker. Instead I was like a cross between an apprentice and a disciple. You emulate me, you take my advice without necessarily understanding it. [I'm] always feeling there's some godlike figure who will reveal to you what's going on like some great master." Similarly, a male student from school A states that he dislikes "the system of design classes where you have a design professor and you're working under his tutelage really." This student would prefer working with two to four design professors so that the student would not be molded in a particular direction by the design professor (Groat and Ahrentzen, 1996, p. 170).

This method can be characterized as a form of 'training' instead of teaching students to identify their own creative processes. Mastery-mystery is only one teaching method, among many, that can occur in the design studio. Traditionally, the charette method is the most common format. The system originated in the Ecole des Beaux Arts in Paris as a form of pedagogy wherein students were given a uniform, common problem and a specific amount of time to ideate a solution. Students would then work until they had achieved their own solution to that particular problem. This style of teaching exists today in various forms: case study approach, mastery-mystery, transmission, and mirroring.

The focus in architectural education is on the teaching of architectural design. This institutional emphasis expresses itself by the number of credits studio receives, as well as the time actually spent in studio and at home working on "studio." There are other courses taught in architecture school, of course, but these play a supporting role. Institutional support is also given to architectural design in that the facilities of the college or university are prepared to meet the needs of the instruction that takes place in the studio, which are typically physically large, with a 'twenty-four/seven' dedicated workspace for each student. In fact, for accredited architecture schools, the National

Architectural Accrediting Board (NAAB) accreditation requirements require that each student beyond first year of architectural design, meaning in the second year of architectural design and above, must be provided with a "cold desk." The cold desk approach allows for students to maintain the same desk space in studio, typically for the length of a semester, with a particular cohort of students and assigned teacher-critic or set of critics. The institutions are also, in most cases, required to provide twenty-four-hour access to the architecture facility so that students can keep projects and supplies at their desks and be able to work on them at any time.

Architectural design teaching typically takes place within the hours assigned for the course, which may be on a "block schedule." Block scheduling, where the design course is scheduled for the same days and times from semester to semester and year to year, is something that institutions rely on to give an amount of predictability in a student's schedule. Architectural design is a constant throughout the years of architecture schooling. This is not always the case at open enrollment institutions, and the type of systemic support and backbone to the student schedule anchoring all of the other courses which is provided by block scheduling is absent. Students in other countries also take courses in architectural design and work in the context of the physical architecture studio, but the culture of architectural design there still may not lend itself to the system of cold desks. Students work on projects at home and bring them into the studio during school hours for the class time designated for architectural design. Students then take their projects home and continue to work on them there. While both methods may be effective, the cold desk approach fosters a type of peer support and social stability, setting

the stage for conducive conditions for cultivating a creative process. This observation will prove to be important later in this thesis.

Because architecture faculty are trained in architecture and not in education, the teaching of creativity is typically based on prior experience or knowledge of the instructor being transferred to students in the design studio through various methods. One of these methods is an approach called *mirroring*. In mirroring, specific skills are taught by watching a "like this" demonstration by the instructor, and the student repeating that specific skill or direction until they themselves internalize it and understand it. Many architecture teachers are themselves mirroring the ways in which they were taught specific skills by their own instructors in years prior. Mirroring is especially effective in visual communication techniques required for architectural project development such as hand drawing, sketching, and model making. A demonstration might occur, then a student may attempt to mimic that skill, and the instructor offers a critique based on how well the skill is replicated or mirrored by the student.

Another teaching method is known as the *transmission* model. Here the instructor passes on knowledge of the way things are, the best way to do things, facts and figures, values, and worthy precedents. It has been criticized for viewing students as "empty vessels" who come to architecture school with no prior knowledge (Crysler, 1995). It is also dismissive of individual cultural or life experience in a diverse student population. In fact, this teaching methodology can be discriminatory to open enrollment students as it fosters an attitude at university programs that transfer students may have been "learning architecture the wrong way" at a previous institution instead of starting as a 'native' or

'home-grown' student who started in the university architecture program as a freshman directly out of high school.

Some students are able to work successfully within the current system, mixing mastery-mystery, mirroring, and transmission methods, but many, especially community college, students would or could benefit from: (1) self-knowledge in the form of reflecting on their own experience, history, mental capacity, emotional capacity, most productive ways of working, and triggers for creativity, and (2) general knowledge about how people learn, and more importantly, how they process information when creating ideas and concepts. The first can be discovered. The second can be learned. There is a psychological commonality among people, a baseline, considerable ability to conceptualize and demonstrate intention. If what varies is individuals' ability to tap into this native ability, as Dewey argued, then wouldn't students benefit from knowing about how this process works from the beginning instead of continuing in the modes of mastery-mystery, mirroring, and transmission, at least in the matter of increasing creative output?

On this view, teachers need to encourage students to delve into their own creative processes instead of, or in addition to, absorbing the design methodologies of the teacher. Mentoring, over and above teaching, is critical here: i.e., understanding, compassion, humor, and kindness. While working with empathy might be problematic in some cases, because it presumes you can know the experience of another person, it is the defining of what mentorship involves, and it is welcoming to all types of students. Without it, many students are conditioned, early on, to view the architecture studio as a cold, unfeeling

place where the occasional extension of empathy and compassion from professor to student is viewed unfavorably.

## STUDIO CULTURE AND THE SOCIAL FACTORS OF CREATIVITY

Architectural education is a specific educational model that is based on an institutionalized cohort of student participants interacting in small groups with a teacher-critic focused on the pedagogical explorations of the design studio. In "studio," the cohort forms a foundation for the student's social relationships that manifest themselves and develop in the design studio and, in a variety of ways, demonstrate characteristics of dialogical teaching and interaction (Buber, 1970; Black, 2005). In architectural education, the primary educational relationships are developed and occur within the context of the architectural design studio since the greatest amount of time and effort is typically devoted to the project-based pedagogy that takes place there.

Social relationships in the design studio impact creativity. Members of a cohort are not necessarily impacted equally, and social interactions are influenced by stereotypes and gender roles in addition to issues of race and class. Research indicates that members of a group don't develop concepts and ideas in isolation, but that those around them have a profound influence. One aspect of this dynamic is the way in which people form bonds by *imitating* other members of a social group. Interestingly for studio behavior, imitation or 'copying' is not a low-intelligence process but actually one that is incredibly complex and requires an innately attuned level of sophistication. However, imitation is not isolated to the domain of human sophistication as there are examples of this phenomenon

in the animal and natural worlds as well. Imitation is a "skill requiring advanced cognitive capacities of motor perception, action planning, and analogical reasoning" (von Hippel & Trivers, 2011). Based on this skill set, "copying" can have deep implications for the development of new skills such as in architectural design.

The converse but equally sophisticated process of *differentiation* is also a byproduct of a group's social organization. Differentiation can be borne out of competition among other members of the group, but it is also a necessary component of a cooperative, synergistic social interaction. Imitation and differentiation do not need to be opposed; they are actually closely related. In fields such as fine art, artists learn technique and composition by replicating masterworks. In "failing," inevitably, to do so, they find themselves. Perhaps the same idea can be applied to architecture. But that would not impinge on the dynamic of interest here, which is the social solidarity of the studio.

Let us look at the patterns of behavior through the lens of "social referents." Researchers Elizabeth Levy Paluck and Hana Shepherd conducted a study wherein they selected a public high school in Connecticut to look at various social networks and norms (2012, p. 900). The main finding came from testing whether or not intervening in the public behavior of the high school's clique leaders (social "referents") had an effect on the students' perceptions of social norms. Paluck and Shepherd found that cultivating a culture against harassment requires sowing the seeds of change with the most influential members of the group and directly addressing the need for positive behavioral changes, first with the referents since they would influence the behavior of the rest of the student

population (2012, p. 901). The importance of studying social relationships lies in attempting to understand the broad consequences of influence within a social network. This is especially critical in the context of the architectural design studio since there are often design leaders among the students of whose influences students and teachers alike might be unaware (Paluck & Shepherd, 2012).

Another important aspect of the social fabric of the design studio is understanding the world views of others. One particular research paper analyzed the nature of various individuals' world views (Chen et al., 2015). The origin of a person's world view is impacted by several factors, and the researchers sought to determine the link between a person's perception of the world and their psychological well-being. Additionally, the experiments in the paper looked at measuring world view influence on other factors such as self-esteem, self-criticism, and life satisfaction. The experiments were conducted with participants from the student populations at universities in China, Hong Kong, and Canada. Participants completed a questionnaire which looked at cultural differences, individual differences, and how these are formed. This research found that people - typically as children – often develop a cynicism that significantly alters their perception of themselves and their place in the world. Some causal factors of this cynicism included class and socio-economic status, unmet expectations, or the belief that other classes of people retained higher status. These issues are important because they are factors that affect all people. In fact, this is both a simple and extremely complex issue. It is simple in that all humans have experiences, alternately cultural and personal, that shape one's perspective on how we believe things are or ought to be. This is a complex issue due to

the fact that there are a nearly endless number of world cultures, sub-cultures, and the complexities resulting from cross-pollination when people move through, travel between and intermingle within these cultures. This issue's importance makes it necessary to tackle the enormity of this subject in the workings of the design studio if we are to accommodate a wide variety of students. Attempting to understand the world view of others, and not just their current problems, can be an effective tool in relating to others and bridging understanding when faced with conflicting opinions.

## THE STRUCTURE OF ARCHITECTURAL EDUCATION

Architectural education has an institutional structure that is specific to the discipline of architecture. This institutional format is informed by the architectural profession and has evolved over time to reflect changes in the architectural profession. The structure of architectural education in turn informs how creativity developed. Whether there is awareness of the structure or not, the nature of institution can either accommodate or hinder how architecture is taught by faculty and how it is learned by the students, and whether a climate exists for creativity to be cultivated. One of the challenges of teaching architectural creativity at a community college is the lack of sufficient institutional structure. This structure includes such key items as predictable course scheduling, large enough facilities, and other institutional supports.

Architectural students are educated in methodologies that will be useful to them in their future roles as architectural designers. And while it may seem that the culture of the profession influences the accepted practices within architectural education, it is actually

architecture-specific institutional structures that determine who is educated within the system and how. This structure even informs how creativity is developed within students through the design studio as a collective.

## SOCIOLOGICAL FACTORS IN ARCHITECTURAL EDUCATION

Although there is now a heightened awareness of the inequity that has pervaded architectural education in the past, that awareness has not in itself extinguished the inequality that remains. Social inequality now exists in various forms within architecture schools, but it exists to an even greater degree beyond architecture schools due to the many students who are not included in the pathway to an architectural education or who were never exposed to architecture as an area of study. The structure and culture of the training for the architectural profession impact the pathways into and through architectural education and contribute to ongoing inequality, especially with regard to access.

The main structural problem of architectural education is that there are students, and therefore potential architects, shut out of the current system of education. Ironically but not surprisingly, the existence of this sector of the student population is invisible to the existing system of architecture schooling. Because students are looking for a way in to the educational pipeline of architecture, they often enroll in an open enrollment institution in higher education such as a community college, junior college or some other form of two-year public college. Very little data exist on students who are interested in an architectural education but are not able to attend. However, these potential

architecture students can be assisted if they attend a two-year college that offers some form of architecture program or classes and come into contact with college or departmental advisors. Some students already know they would like to pursue an architectural education, and they seek out an open enrollment program in architecture. And yet the majority of students likely enroll in an open enrollment school, such as a community college, not knowing what area of interest they might enroll in, but they find architecture as one of the available options (CCCAP, 2014).

Recruitment from high school to community college architecture programs is not typical as many students experience a gap in enrollment between high school and college. However, recruitment from high school to community college does exist in regions and communities where there are systems of obtaining college credit through courses taken in high school such as dual credit coursework. Also, there is not a formalized system for identifying and recruiting students for architecture from high school unless it is through an individual college, local school district, or summer programs in architecture. Community college architecture programs often lack the infrastructure and resources for active recruiting from high schools and other sectors of the local community and rely on students self-selecting as architecture majors. Self-selection works when students manage to find their way into the program of their choice, but this choice is not usually informed by identification of aptitude or potential talent of creativity. Self-selection for an architectural education can be problematic for students for a variety of reasons. One of the primary reasons is that there are many students who are potentially talented and

might demonstrate an aptitude for architecture, but for a variety of reasons do *not* self-select or self-identify as an architecture student.

It is this phenomenon of identification that pertains to social identity theory as represented in architectural education. This theory is exemplified by the dichotomy of having members of a group known as the in-group and those who are outside of the group known as the outgroup. In defining who is in each group, it is a psychological distinction on the part of each participant as to who psychologically identifies as belonging within the group (Tajfel, 1963). So, the in-group in architectural education would definitely include the students, faculty, and administrations of professional, NAAB-accredited school of architecture. This is because these groups have been admitted into the pathway that directly leads to graduation, internship, and professional licensure for architecture. Other institutional participants and students not included here would likely identify with being in the out-group since they are excluded from the pathway to professional degree attainment and licensure. The exceptions to this may be in two-year institutions offering architecture who have a transfer agreement with a university offering professional architecture degrees which creates a structurally contiguous pathway students at the two-year college. This is part of the reason for lack of recruitment on the part of the community college architecture programs. These programs are members of the out-group if – and this is often the case - they cannot provide a pathway to architecture, and it is difficult to recruit students if their two-year architecture experience is effectively a terminal degree. It is in this way that the pipeline to architecture is essentially a 'leaky pipeline' since students may enter into the system and be forced to leave the path due to a

lack of future, transfer opportunities. One feature of this system is that those within the current system of architectural education don't know the extent of the outgroup members since they only come in contact with the in-group students on a regular basis.

Given the context of potential students who do not currently have access to the architectural education system, it is shortsighted to continue to look at diversity only in terms of who is at or is entering the NAAB-accredited university system. This is because the focus is on the diversity of the in-group, when this group is only selected from high school seniors and incoming university freshman who demonstrate academic readiness generally. These academic requirements are usually dictated by the university and are not specific to architecture unless a portfolio is required. If a portfolio is required, then the standards may be more aligned with students demonstrating architectural readiness, but then that potentially disadvantages applicants who have not had previous contact with architecture or the arts. It is often the high status participants in a system that lack the awareness of lower status counterparts in their own system, or that status even exists.

Disruption is necessary in architectural education to address identifying potential creative talent in a new way. This is necessary because change doesn't just happen on its own since architects are a relatively small percentage of the population with only around 110,000 registered architects in the United States. Architects are an insular group, and the size of this professional group is not large enough to make changes in the culture of the profession unless it is over a long period of time (Durkheim, 1956, p. 77). In terms of increasing the diversity among various groups within the architectural profession, there are several groups that are currently making positive changes within a variety of smaller

subgroups. For example, groups such as the National Organization of Minority Architects (NOMA) are looking at issues within the architectural profession that are working against greater inclusion into the profession.

In their 1996 article "Reconceptualizing Architectural Education for a More Diverse Future: Perceptions and Visions of Architectural Students," Linda N. Groat and Sherry Ahrentzen analyze, through an extensive research study, the means by which women and minority students are unintentionally marginalized by the teaching methods and culture of architectural education (Groat & Ahrentzen, 1996). More than twenty years later, however, these same issues of bias in educational delivery methods exist, but in an increasingly complex context.

In her 2003 book *Unequal Childhoods: Class, Race, and Family Life*, Annette Lareau offers an expansive, qualitative look at the family effects and resulting parenting styles on children of various races and classes. Lareau outlines and compares the parenting styles she labels as Concerted Cultivation and Natural Growth. In the concerted cultivation model, children who develop individual talents tend to breed and maintain an emerging sense of entitlement throughout young adulthood and later life. In the natural growth model, parents provide love, food, and safety but structured extracurricular activities are replaced by free time as well as time spent with extended family. This natural growth system of parenting fosters an emerging sense of constraint and institutional mistrust and is typically more common in children and families of lower socio-economic classes. These issues provide some insight as to how children are guided toward or away different types of activities, and later careers, which might affect them

well into adulthood. This might also shed some light onto why younger adolescents and high school students do or do not consider architecture to be a viable career pathway for themselves.

In Joan Ockman's book *Architecture School: Three Centuries of Educating Architects in North America* (2012), our focus is the chapter titled "Nonprofessional Education: In Pursuit of a 'Broad Understanding of Architectural Values.'" This chapter provides historical context and precedents for the inclusion of architectural education in elementary and secondary schools as well as courses at the college level that are not part of an architectural degree program. This is critical to the current conversation of alternative pathways in architectural education because there is actually a long history of broad architectural education that has, only in recent years, become closed off. So it is an important reminder to those currently in the profession that this concept is less 'disruptive' as an idea than most architects probably realize.

Addressing the concepts of cultural capital and habitus as they apply to architectural education is necessary in order to understand how and why there continues to be a lack of diversity in architecture as a profession and in architectural education. One related study closely examines the workings of two schools of architecture in the United States to look at the means and methods by which the academy of architecture culturally reproduces itself (Payne, 2015, p. 12). In doing so, the article reveals why the profession is lacking in diversity of all types. The findings are then analyzed and laid against the backdrop of the work of French sociologist Pierre Bourdieu to present a case study that is rooted in sociological theory. Bourdieu is widely known in sociology

literature for his work on culture and the motivations for how and why people behave the way they do. He viewed culture as form of 'capital' in society, and this 'cultural capital' is intertwined with dominant groups and their systems of power (Webster, 2011). It should also be noted that architectural theorists do not always work in an interdisciplinary fashion, so it is somewhat rare to find sociological theory applied more recently to architectural education.

An article by Garry Stevens also outlines a lack of diversity in architectural education, specifically calling out architectural curriculum and pedagogy, looking through the lens of the Pierre Bourdieu's work. However, this article is well over twenty years old and is describing the same problems and issues that exist in architectural design education today (Stevens, 1995, p. 107). This gives additional context to see the urgency of addressing access and diversity problems, but also to contrast progress or initiatives that have been attempted in the last two decades, citing the need for increased vigilance now on the part of the architectural academy.

# Chapter 4: Individual Creativity: *An Interdisciplinary Approach*

In order to customize architectural education to a broader population and/or help people tap into their own creativity, a greater understanding of the commonalities and functionality of how humans ideate and solve problems is necessary. Upon achieving some level of understanding of these concepts, architectural educators can instruct and train students to identify and exercise the origins of their own creative approach. Discovering the drivers of human creativity can also illuminate methods for establishing an individuated creative process for students of architecture. Additionally, looking to human cognition to discover new methodologies for problem solving can lead to breakthroughs in architectural design for early, beginning design studios. In this chapter we take a closer look at contemporary theories of individual creativity.

## DEVELOPMENTAL STAGES

In American culture and education, there tends to be a different standard of judging creative pursuits and behaviors within the confines of childhood than in adulthood. Modern interpretations of the confluence of creativity and human imagination rely on the acceptance that adult creativity must be gauged by both its novelty and appropriateness (Amabile, 1983). These dual priorities often portray creativity as a process so as to better analyze and dissect the operation by which children, and later adults, express themselves and the links to their means and methods of creation and play.

Based on their theoretical definitions of creativity, many researchers believe that a person's age contributes to their ability to create a truly novel concept. That is, creativity can only be present if an idea is not just new to the person but to society at large. On this definition, a child's pretend play by itself is not necessarily creative. The separation of childhood and adult creativity is evident in the early work of theorists such as Jean Piaget and Lev Vygotsky (Piaget, 1951/1967; Vygotsky, 1930/1995):

> Full-range creativity is not considered possible until well into adolescence, when imagination can be integrated with advanced logical thought processes, that is, formal operational thought in Piaget's terms. Vygotsky stressed the distinction between children's pretense and the creativity of mature artists and scientists, suggesting a developmental sequence beginning with children's imagination and pretend play and developing into higher mental functioning in the form of inner speech (daydreaming). In his view, creative potential increases with the growth of understanding and knowledge that life experience provides (Hoff, 2013).

While on the surface, it may stand to reason that more mature thought processes must develop in order to facilitate creativity, this approach may ignore the variation of experience in adolescents and young adults. Since different adults have not experienced the same or even similar developmental paths from childhood, the experience of—and exposure to—creative thinking patterns throughout cognitive maturity may affect an adult's perception of their own ability to be creative. As in, "I have never invented anything *really* new, so I must not be creative." There are other experiential factors at play in adolescence that can radically alter an adult's capacity for creativity by harming their belief in that very capacity.

Still, other theorists believe that young children cannot be considered to be fully creative if the *intention* to be creative is absent. Creativity cannot be accidental, and then

recognized as "creative" by a mature other, like a teacher. This intentionality in slightly older children such as ten-year-olds is possible in that they are able to formulate ideas and imagine worlds independent of reality, their peers, and their parents (Hoff, 2013). To illustrate:

> Exceptionally creative people are described as individuals who worked hard for long periods of time with a clearly set intention in a domain in which they had a deep interest. In studies of children, it is also possible to find intentionality and systematic development of creative products or ideas over longer periods. (Csikszentmihalyi, 1996)

This is significant because there may be intention that is present, but not necessarily conscious, especially in the imagination and play patterns of an older child.

While not categorized as creativity specifically, fictional worlds relate to the human potential for imaginative thinking. The impact of fictional worlds on the development and thinking of children as they navigate the differences between pretend and real worlds is developmentally significant as it specifically addresses the degree to which children learn and benefit from exposure to fictional worlds. Some early theorists in child development such as Piaget (1962) concluded that children used pretense as a default function, and these activities did not influence learning or development (Pellegrini & Galda, 1993). And still others such as Vygotsky and Leslie (1987), while examining this subject in children, indicated that learning was confined only to the realm of reality. The author Angeline S. Lillard (2013) expanded on this idea, writing: "Piaget (1962) and Vygotsky (1978) claimed that pretend is quarantined from real, a claim recently echoed by Leslie (1987)." If this is true, then pretending (or apprehending someone else pretending) has no impact on one's real-world representations. But this defies how

anyone could ever learn from the fictions they create. In looking at the practice of childhood creativity further, Lillard (2013) writes:

> Pretense behaviors often mimic the real behaviors of adults, and are behaviors children might well later enact for real (playing house, school, war). Do children who play more at building houses later become better house builders (something even Plato suggested; Lascarides & Hinitz, 2000), and because of the practice as opposed to the interest.

Of particular relevance to creativity is the idea that early participation in a specified, creative activity impacts learning and perhaps influences later preferences in adults. For example, a few theorists in the architectural community posit that young people from some cultural or socioeconomic backgrounds will not choose to pursue architecture as a career because they cannot "see" themselves as an architect. This means that either they do not personally know someone who is an architect, or they are not exposed to depictions of architects who look like they do, or come from a similar neighborhood or circumstance. But what if, instead of exposure to a mentor or future version of themselves as an architect, the very act of early *pretense* at creating spaces or imagined buildings allows a child to experience a type of "pretend-pretend leakage" that has a direct, real causal impact on their adult lives? There would be hope of channeling children of all socio-economic backgrounds ultimately into the profession.

In children as well as adults, divergent thinking is more specifically examined and accurately measured by administering a creativity test such as the Alternative Uses task mentioned earlier (Bunce et al.). This assessment links directly back to examinations of the creativity testing movement in the middle part of the twentieth century. Twenty-first century researchers have used findings from creativity testing in children to directly link

to and compare the results of creativity tests in adults to see if there is a causal link between pretend play in childhood and creativity in adults (Russ, 2013, p. 138).

Regarding the impact of creativity and early childhood education, several research models have tried to measure and analyze the efficacy of increasing creativity in an educational environment. A 2005 study by Sonja Baumer, Beth Ferholt, and Robert Lecusay titled, "Promoting narrative competence through adult–child joint pretense: Lessons from the Scandinavian educational practice of playworld" analyzes the extent to which preschool and elementary school aged children are exposed to play-based pedagogy as an exploratory learning tool. The authors judge that the education of young children in the United States has suffered a series of setbacks in recent years due to the marginalization and removal of pretend play from the curricula. They contend that implementing play itself as a valid teaching methodology has diminished in this country due to the rise of mandated standardized testing and the frequent use of test content as the primary source of teaching materials. Comparing American to Scandinavian models of early childhood education (the Scandinavians promote art and pretend play) is instructive. "These symbolic and representational activities [of Scandinavian models] are widely seen as beneficial developmentally" (Goncu & Klein, 2001; Lillard, 2002; Piaget, 1962; Sutton-Smith, 1997; Vygotsky, 1982).

Sweden and Finland were chosen for examination here due to their high rates of literacy and the value that is placed on the integration of play in early childhood education. In Sweden, the work of Gunilla Lindqvist (1995, 1996, and 2001) highlights the development of the "whole child" through the creation of "playworlds, an educational

practice that includes pretend play, dramatic performance of a text from children's literature, and visual art production." In this particular Swedish view, children and adults should work together to create these worlds so that the adults' cultural experiences can be taught and transferred to the children within the context of pretend play. In Finland, the work of Pentti Hakkarainen (1999, 2004) highlights the educational theory of "narrative learning" that was inspired in part by the work of Lindqvist in Sweden. This approach of narrative learning combines "pretend play and elements of school learning." The Scandinavian principles of playworld and narrative learning were later tested on groups of children from a public elementary school in Southern California to determine the effects on a diverse student population. The results here varied in that the "narrative" of the parents was not homogenous (Hakkarainen, 2004).

Several studies have been conducted to demonstrate the ways in which children delineate the boundaries of the non-real and the real. One theme that emerges is the idea that the particular age of the child influences whether or not they are able to understand and/or conceptualize the distinction between fiction and reality. Some studies note that a child's capacity for differentiation on matters of imagination improves with even small, incremental growth through the preschool and early elementary years (Samuels & Taylor, 1994). One begins to suspect that it's never too early to start cultivating creativity, by any means. Perhaps that's true, too, of offering the idea that anyone can be an architect.

## PSYCHOLOGICAL FACTORS OF CREATIVITY

Psychological factors and reactions can influence how a person perceives creative problems and interprets the expression of their own creativity. One study (Joh et al., 2011) addressed the ability of students to engage in visual imagery. This ability appears not to be much influenced by age. Although the subjects of the study were three-year-olds, the principles of the study could be applied to visual learners of all ages. In fact, the study notes that "adults' ability to use and benefit from visual imagery is clear and well-documented" (Joh, 2011). Because this is more established as beneficial in adults, these methodologies could be applied to visualization studies in architectural study. The implications of Joh's results could be directly applicable to possible visualization studies for adult learners in architectural education.

There are some parallels that can be drawn between the intuitive nature of pretend play and the intuitive aspects of spatial reasoning and visualization. However, the process of using visualization to solve logical problems demonstrates that there can also be an element of mental training that takes place instead of relying solely on a student's intuition. This approach provides an invitation to a specific mental environment that introduces rational steps toward allowing students the mental means necessary to solve a problem. Perhaps there are additional methodologies that could be explored in order to assess how students naturally approach a problem, then later analyzing the efficacy in those who have been exposed to analytic visualization training.

*Imaginative resistance* is a psychological concept that looks at the degree to which many people *avoid* conceptualization of new ideas. The psychologist Tamar

Szabo Gendler (2000) explores the topic of imaginative resistance and hypothesizes about the nature of human imagination. While some literature regarding the imagining of fictional worlds deals with adults' and children's capacity for conjuring self-selected fictional scenarios, Gendler instead analyzes the extent to which humans are inclined to mentally pursue ideas that may be morally repugnant. She writes that "the primary source of imaginative resistance is not our inability to imagine morally deviant situations, but our unwillingness to do so" (2000). Other researchers analyzing various aspects of the topic of imaginative resistance categorize a series of adult responses to fictional scenarios (Barnes & Black, 2016), but this could provide insight into understanding how adults may resist creative or intuitive ideation as well. Might there be a *moral* resistance to creativity in some communities? Or to thinking of oneself as a future architect? These are unanswered questions.

The psychologists Deena Skolnick Weisberg and Joshua Goodstein (2009) write about a concept known as the Principle of Minimal Departure. This principle holds "that everything about reality is true in fiction unless it is explicitly forbidden by the text" (Weisberg & Goodstein, 2009, p. 71). This has implications for how much of a story is comprised of universally held facts such as mathematics or physical laws and the importation of those facts into the story by the reader. The study that the authors explore is based upon the idea that "importation depends primarily on how similar the fictional world is to reality (Distance) and also on what type of fact is being imported (Fact Type)" (2009). Interestingly, the results of the study indicate that study subjects filled in more story information than anticipated in order to round out the story world and that the

importation of facts by participants was not predictable based upon the "checklist of explicitly violated facts" (2009). The impact on ideas of creativity and architecture here are that adherence to explicitly stated parameters in a given problem may be more embedded and ingrained than we may realize. And if the expectation is that students will easily be able to deviate from some given parameters in order to achieve a creative solution to a given problem, it may be too psychologically confusing to understand which norms are acceptable to violate and which are not. We find again, a moral or ethical dimension.

Executive function (EF) can act as another contributing factor in the correlation between creativity and imagination. Stephanie M. Carlson and Rachel E. White (2016) examine the role executive function plays in the development of critical skills as well as its function as a predictor of success in a variety of performance areas later in life. The authors note the causal link between EF and the development of key components of cognition "including intelligence, attention, memory, and reading and math achievement" as well as "the development of emotion regulation, conscience, and social competence including theory of mind" (Carlson & White, 2016, p. 420). As the recognition of executive function's importance in development grows, so too does its relation to imagination and creativity and their related modes of study and analysis.

Since maturity is significant in one's understanding of creativity as an intentional endeavor, then another major contributing factor to evidence of brain maturation is Inhibitory Control. Researchers Carlson and White note specifically that "development can be thought of as not only the progressive acquisition of knowledge or skills, but also

as enhanced inhibition of representations or responses" (2016). Lev Vygotsky stated that "a child's greatest self-control occurs in play" (1967). This level of restraint is exhibited because pretend play "requires the suppression of impulses so that social rules for behavior can be followed" (Vygotsky, 1967 & Nicolopoulou, 1991). If this is true, then there must also be social, play-based scenarios that are most likely to result in the focused development of executive function. Two children could be playing together in a shared imaginative narrative, but perhaps there are other situations - such as collaborative, creative group learning by adults, as happens in an architecture studio - that could be considered conducive to the development of inhibitory control, too.

The influence of social interaction on executive function, play, and psychological distancing reflects the relevance of social relationships in architectural education. The reader may recall my description of the studio environment. For example, social associations in adults is associated with levels of mental construal. That is, how individuals as adults perceive the behavior of others will be influenced by their hypothetical distance from the behavior. The process and experience of psychological distancing as a young child can also have a direct effect on their ability to empathize and perceive the feelings of others later in life. This can also prove true for humans being able to demonstrate compassion as adults. In studies involving self-distancing (White and Carlson, 2016), children who were able to distance themselves from stimuli were able to gain and assert greater control over their own behaviors. In one 2005 study (Pencipe & Zelazo), researchers showed that preschoolers "were more likely to delay gratification when making decisions for an experimenter than for themselves." As for

research regarding architectural education, it remains to be seen if the distancing phenomenon holds true in the design studio, perhaps in a mentor-mentee relationship, or in a mirroring or transmission one. The point is: it's worth exploring what group situations are most conducive to a person's creativity. That would require a much larger investigation than this thesis can mount.

# Chapter 5: An Experiment: *Creativity Assessment for Architecture*

The focus of the thesis is to analyze creativity and its role in architectural education. This empirical study reported in this chapter seeks to characterize the nature and role of creativity in the early, foundational years of design training. It is predicated on the assumption that possessing creative capabilities contributes to success in architectural design (Karlins et al., 1969, p. 203). If creative talent in first-year architecture students could be measured in some detail, and differences determined, that data could be used to shape design curricula that best suited the needs of a variety of students.

## STATEMENT OF THE PROBLEM

The study is exploratory in nature, addressing issues that exist at the intersection of architectural education and the community college experience. The mission of the community college is to provide access to higher education, but this approach may potentially be in conflict with traditional pedagogical methodologies of early design education in accredited, university-based, professional schools. This is because the structure of the design studio in architecture school supports a project-based approach wherein students work within a set of given project parameters to generate an individual, original solution to the problem. And since community colleges maintain open admissions policies wherein academic requirements typically do not restrict or prohibit enrollment in a selected field of study, students who enroll in architectural design

are likely to have vastly different levels of preparation and experience with architecture. Additionally, prospective students self-select their choice of major, often with little input from college and departmental advisers. As a consequence, the coursework for first-year architectural design in an open enrollment institution such as a community college is available to all who choose to enroll. This results in a naturally diverse group of students, ranging in age, for example, from eighteen to thirty-five.

Educating a diverse student body is desirable as a goal in architectural education and critical to improving the architectural profession. However, teaching architectural design in the community college environment presumably requires a different approach from university programs. Additional interventions and assessments of student ability are necessary in order to provide an environment where all students have an opportunity to succeed. An egalitarian, uniform approach to beginning design might provide all students with identical instruction, but this technique can result in high levels of dropout and lack of retention due to the iterative, and often rigorous, lockstep nature of the process. A more balanced approach to first-year instruction, in community colleges, certainly, would be one of equity, which favors a more flexible, customizable curriculum depending on the maturity and creative needs of the individual students. The study described in this chapter created an instrument for assessing students' creative potential at the beginning of the first design course, with a view to gearing a curriculum that would educate in design as well as maximize student retention and persistence.

The current knowledge base in creativity assessment uses a generalist perspective. An instrument to gather information about creative potential in a specific cohort requires

a domain-specific test. Here the domain is design, and within that, architectural design. One goal of assessing creativity of architectural student groups in both university and community college architectural programs is to observe how students *react to the test assessment itself* and to address individual differences, confidence, and behavioral components when faced with a creative task. Another goal of the study is to gather information from the creativity assessment artifacts created by students to see if patterns emerge in the novelty of the responses, and therefore, the type and level of creativity. The resulting data at the beginning of an academic semester can assist faculty in creating curriculum that can be tailored to that particular cohort of students. The goal here is not to dilute the quality and rigor of the design education students will receive. It is quite the opposite, in fact, since the objective is to provide additional, supplemental exercises so that any deficiencies can be addressed within the curriculum of first-year design. The expectation is that students will be better prepared to enter the second year of design education, then transfer to a university program at the expected level of preparation.

## HYPOTHESIS

The expectation of this pilot study was that it would likely demonstrate that the university student group is generally better prepared academically for architectural curriculum and is, therefore, better able to navigate and complete the assessment itself, than the community college group. However, there was also some expectation that the community college group would perform well on some of the non-linear tasks in the categories of flexibility, fluency, and divergent thinking. The main driver of the study is

to determine where there are differences between the university and community college student cohorts, so that the strengths of the university cohort are revealed and any deficiencies in the structure and curriculum at the community college level can be addressed.

## METHODOLOGY

### Study Design

The design of the study began with the goal of creating a creativity assessment specifically designed for first-year architectural design students. The title of the test assessment is referred to as the *Creativity Assessment for Architecture* for the descriptive purposes of this study. This assessment uses a *factor analysis* approach, theoretically rooted in the principles of *factorial research design* (Guilford, 1968, p. 87). Factorial research design embeds various facets of creativity into the research instrument, and factor analysis looks at individual traits and aspects of creativity to examine the ways in which individual creative strengths are expressed. Individual components of creativity were researched and gathered from standardized, theoretically-based creativity tests (Barron, 1952; Torrance, 1962; Wallach & Kogan, 1965; Guilford, 1967). Those components were then filtered to collect those that were deemed applicable to the discipline of architecture.

To start, an online questionnaire created specifically for this study (See Figures 5.1 to 5.3) containing twenty-two creativity components was sent (in the Fall 2017 semester) to an advisory panel consisting of twelve university and community college

architectural faculty. This advisory panel was surveyed on what *they* deemed to be the most critical components of creativity that predict success in architectural design curricula. The panel was asked to rank the components in groups thus: Extremely Important, Very Important, Moderately Important, Slightly Important, and Not at all Important. The list of twenty-two creativity components that were ranked is as follows (in alphabetical order):

- ABSTRACTION: Ability to conceive of an idea not represented by a literal instance.
- AESTHETIC ASSESSMENT: Ability to evaluate the visual qualities of a given schema.
- AMBIGUITY: Ability to express a concept whose interpretation is unclear by virtue of having more than one meaning.
- AWARENESS: Ability to seek active inspiration from multiple sources to nurture original idea generation.
- BOLDNESS: Ability to push boundaries beyond accepted conventions by taking risks in idea generation.
- COMPLEXITY: Ability to analyze large quantities of information in order to manipulate the relationships between such information.
- CONCEPTUAL REASONING: Ability to formulate theories about the nature of objects and ideas.
- CONFIDENCE: Ability to act with strong belief in one's abilities.
- CONNECTION: Ability to synthesize disparate, unrelated pieces of information.
- CURIOSITY: Demonstrated desire to learn more about a particular subject matter.

- DIALOGUE: Ability to utilize architecture-specific vocabulary in communication with others.
- DIVERGENT THINKING: Ability to consider a variety of aspects which can lead to novel solutions to a given problem.
- ELABORATION: Ability to generate detailed responses to a given problem.
- FLEXIBILITY: Ability to maintain an attitude of adaptability while working toward a design solution.
- FLUENCY: Ability to demonstrate skillfulness in utilizing a design-oriented skillset.
- MULTIPLICITY: Ability to generate, with an equal amount of effort and ideas, a variety and number of solutions to a given design problem.
- ORIGINALITY: Ability to generate unique responses to a given design problem.
- PARADOX: Ability to simultaneously accept and work with statements that are contradictory.
- PERSISTENCE: Ability to continue to try to derive stronger solutions to a design problem even when good ones have already been generated.
- PERSPECTIVE: Ability to shift one's viewpoint on a situation in relation to other ideas and people.
- REPRESENTATION: Ability to substitute a symbol for a conceptual idea.
- RESILIENCE: Ability to take criticism of ideas, incorporate feedback, and continue to generate ideas.

- RESISTANCE TO PREMATURE CLOSURE: Ability to demonstrate an openness of mind that allows for original ideas to form, taking into consideration all available information.
- SENSITIVITY: Ability to sharpen affective processes to empathize with others to understand a user's needs and requirements.

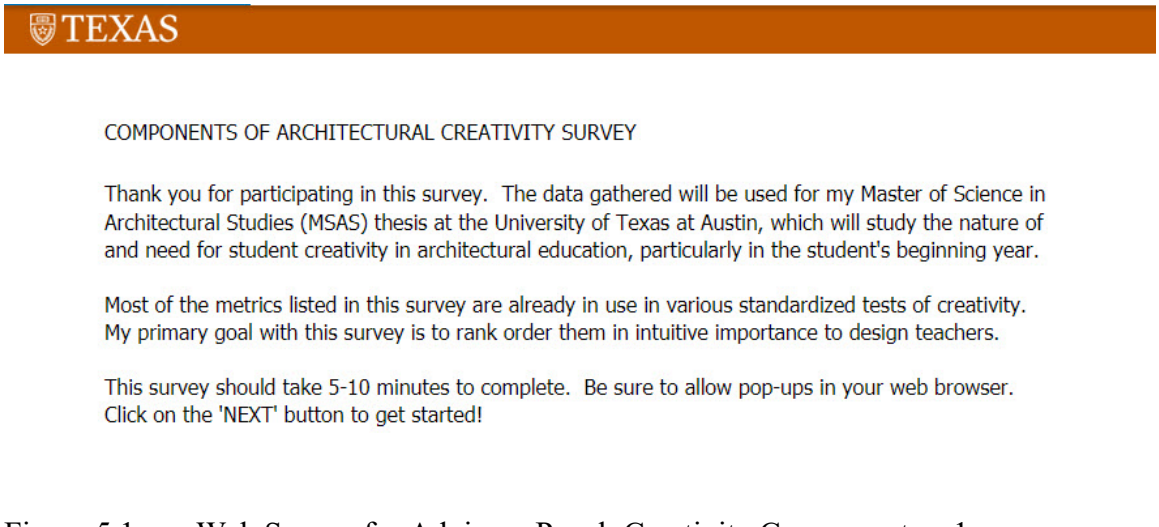



Figure 5.1: Web Survey for Advisory Panel: Creativity Components – 1

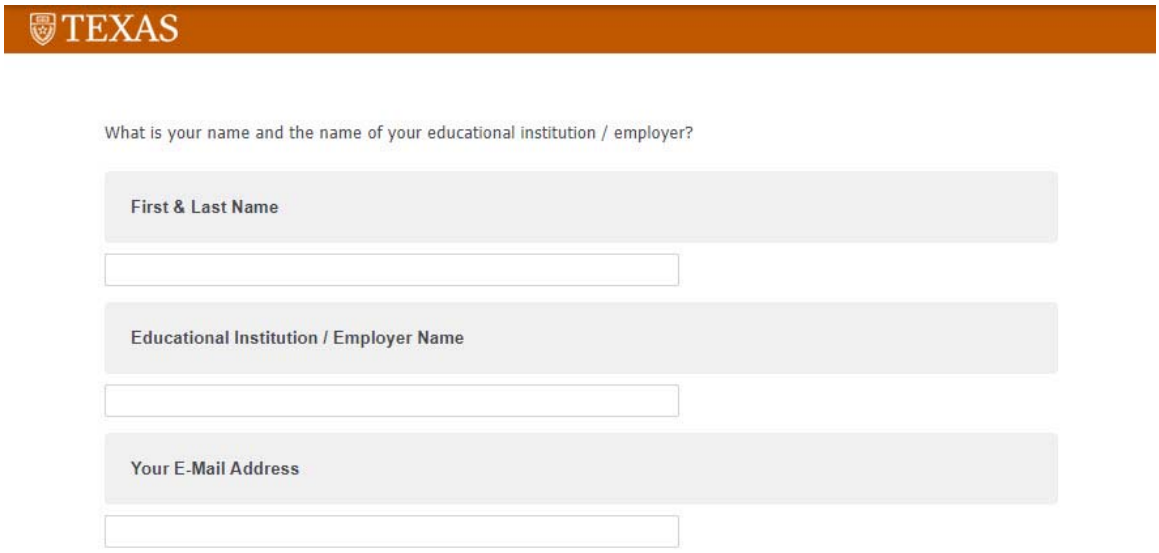



Figure 5.2: Web Survey for Advisory Panel: Creativity Components – 2

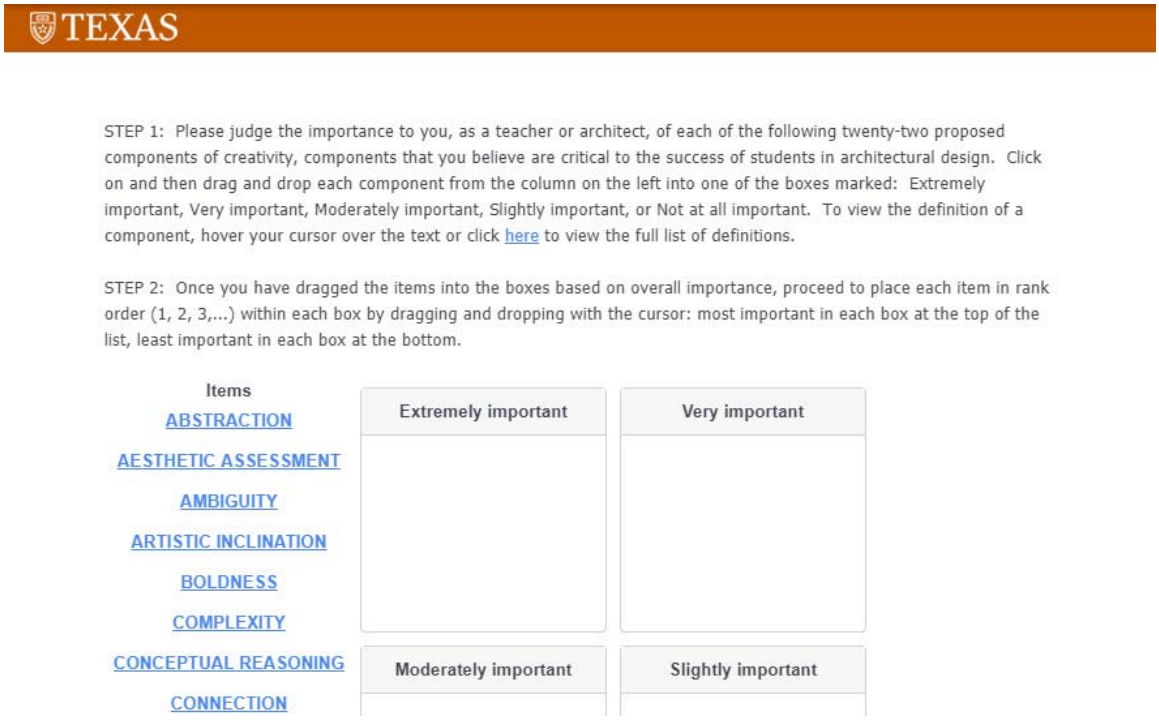



Figure 5.3: Web Survey for Advisory Panel: Creativity Components – 3

The ranking information of the creativity components was then used to inform the types of questions to be asked in the assessment. The resulting creativity assessment and its associated grading metrics were customized for an architectural audience and were based on the theories and methodologies of standardized, model creativity assessments and tests such as the Torrance Test of Creative Thinking (TTCT), Barron-Welsh Art Scale, Wallach-Kogan Creativity Test, and Guilford's Alternative Uses Task. Additional questions were influenced by tests used in psychological, behavioral, and cognitive assessments (Duncker, 1945; Weisberg, 1973, p. 256). Demographic information collected as part of this assessment also included an optional set of questions regarding participant gender, age, and ethnicity. As interdisciplinary as the research was to create

the instrument, it was compiled by an architect (the author of this thesis), with input from architects, psychology researchers, and educational psychology professors, then given to architecture students and graded by architecture teachers experienced in first-year teaching as well as higher years.

## Location

The data was collected in two separate locations on the same day in the Spring 2018 semester, surveying two separate student groups. The survey was conducted at the University of Texas at Austin in the School of Architecture in the fifth floor studio space in Sutton Hall. Permission to conduct the survey with human participants at UT was granted by the Institutional Review Board (IRB) at UT-Austin.

The other survey was conducted at Austin Community College in the Architectural & Engineering Computer Aided Design Department on the second floor of Building 3000 at the ACC Northridge Campus in Austin, Texas. Permission to conduct the survey with human participants at ACC was granted by the Research Review Committee of the ACC Office of Institutional Effectiveness and Accountability (OIEA).

## Participants

### *Target Population*

The study population included currently enrolled students in the Spring 2018 semester at both the University of Texas at Austin and Austin Community College. The students included in the study were those who self-identified as first-year architecture students through their enrollment in one of the following courses:

- UT-Austin: ARC 310L – Design II / ARC 311L – Vis. Comm. II
- ACC: ARCH 1303 – Architectural Design I
- ACC: ARCH 2301 – Architectural Freehand Drawing I
- ACC: DFTG 1405 – Technical Drafting

***Inclusion / Exclusion***

Student participants were enrolled in the courses above and were not excluded on the basis of age. The age range of the participants was approximately eighteen to thirty-five years of age, but this is only an estimate based on the limited information provided by participants in the optional demographic survey attached to the creativity assessment.

***Benefits***

There were no direct benefits to students for participating in the study. The creativity assessment that students participated in may have challenged participants in ways not previously tested and may have potentially enlightened the subjects as to their own creative potential. However, because anonymity was used to protect student privacy, assessment results were not and will not be shared with individual participants.

***Risks***

The potential risk to the participants was no greater than in everyday life. As there were no anticipated adverse effects from participating in the creativity assessment, the risks to participants were minimal. The time commitment on the part of study

participants was approximately one hour. This one-hour time commitment was one-time only and will not recur.

### *Recruitment*

The potential study participants were told of the study by the instructors of the architecture courses listed above at both UT-Austin and Austin Community College. The participants were then recruited for the study by the primary researcher of this project. Student participation was voluntary, and their participation, or lack thereof, did not impact their grades or assessment in the class.

### *Informed Consent*

In order to protect the privacy of the participants, a waiver of document of informed consent was granted by both institutions requiring that only a brief oral description of the research needed to be provided to the study participants. Completing an informed consent form would have caused the participants to be uniquely identified, and part of the rationale of the creativity assessment is to gather data without compromising the privacy of individual students.

### *Privacy*

All student participants were given a numbered assessment that identified their results, but no individual personal data such as participant names, addresses, and/or student identification numbers was collected by the researcher. General demographic

data including gender, age and ethnicity information was collected voluntarily as an optional written measure at the end of the assessment, but this information is not linked to student participants with any other personal identifiers. This information is only linked to the number listed on the assessment, so the anonymity of the participants serves as the protection of their privacy.

### *Confidentiality of the Data*

The data was collected via a paper questionnaire distributed to student participants. The resulting study data is securely stored on a password protected computer, and the data will be kept for approximately two years. The data is anonymous since it cannot be linked back to the study participants. After the requisite two year time period has expired, the original study data files will be deleted from the password protected computer where they are currently stored.

### *Compensation*

No compensation was provided for any of the study participants.

## Data Collection

One of the methodologies of this study was to gather information from two different student populations: one at a university with selective admissions criteria (The University of Texas at Austin) and the other at an open enrollment institution (Austin Community College) in order to compare results from the different student populations.

The assessment was conducted with student participants at both the UT-Austin and Austin Community College-Northridge campuses on the same day in the Spring Semester 2018. The assessment was scheduled in advance with the professors of the predetermined classes listed above, and written protocols were provided to students of those classes prior to handing out the assessment. The professors of these courses granted permission to use class time to conduct the assessment in the Spring 2018 semester. Students had the option to opt-out of taking the assessment if they anticipated any negative consequences of taking it.

Once students were gathered in the class, a brief set of the same oral instructions were read aloud to test-taking groups at both locations. After that, one numbered test booklet was given to each student taking the assessment, and students were instructed not to begin until told to do so. A timer was then set with a limit of forty minutes, and students were instructed to begin when the timer started. Once the time limit had expired, students were instructed to stop the assessment. Students were informed that there was a short, but optional, demographic survey with data to be collected and catalogued as part of the thesis work if any of them were willing to participate. Creativity assessment results were not and will not be shared with participants at a later date in order for the anonymity of students to remain intact and their privacy protected.

**Analysis Methods**

The finalized test instrument created for this study and distributed to student participants was prepared as a printed, paper booklet. While the test assessment is

referred to in this research as the *Creativity Assessment for Architecture*, the test booklet that was completed by the study participants was titled on the front booklet cover: *Learning Styles Assessment for Architecture*. This change was necessary so that student participants in the study would not be made aware that creativity is the main item being tested by the included questions. The final test survey instrument contained fifty-nine questions, all of varying value depending on the maximum number of points assigned to each question based on the importance of the creativity component assessed. The total points possible for the fifty-nine questions on the test is 195 points. The format of the questions varied depending on the creativity metric being assessed, and questions include such types as *drawing completion, short answer, true/false,* and *multiple choice*.

A grading rubric was prepared prior to student participants completing the assessment. Not all questions were given equal value in number of points, and some questions had a range of points possible depending on the number of unique responses given. Overall, there were two methods of analysis used to assess the results of all the creativity assessments. The first analytic method was to score all the assessments using the grading rubric, then record the points awarded for every assessment for both schools. The second method of analysis was for the researcher to look beyond the numerical score value for all of the individual tests and evaluate if there were any significant patterns or trends that emerged collectively in the data.

## RESULTS

Response rates for the student participants who completed the creativity assessment were as follows:

| | | |
|---|---|---|
| Total assessments completed: | **74** | |
| - UT-Austin: | 49: | 66.2% of participants |
| - ACC: | 25: | 33.8% of participants |
| Total number of students who opted out of taking the assessment: | **14** | |
| - UT-Austin: | 5: | 35.7% of opt-outs |
| - ACC: | 9: | 64.3% of opt-outs |

While the overall scores below indicate a quantitative measure for the assessments, some qualitative patterns were visible in the administration of the test. For example, regarding the number of students who opted out of taking the survey at each school, the reasons for not taking the survey were quite different. At UT-Austin, some students arrived late to the studio or were recovering from having a major semester design project due the day before. For all the students at UT who opted out, none of them did so because of anything on the test, and none of them saw the test when deciding to opt out. However, at ACC, all but one of the students who did not take the assessment decided to opt out *after* looking at the questions in the assessment booklet. This indicates an element of confidence, or lack thereof, in attempting to answer questions in the assessment. Also, the social structure of the design studio is nearly non-existent at ACC due to a lack of any

consistent student cohort as students take classes in different semesters, so there is lack of confidence in gaining any assistance through a social network when taking the survey.

The overall numerical scores of the completed assessments for both schools are charted below with the average overall score for each school charted among the individual participant scores:

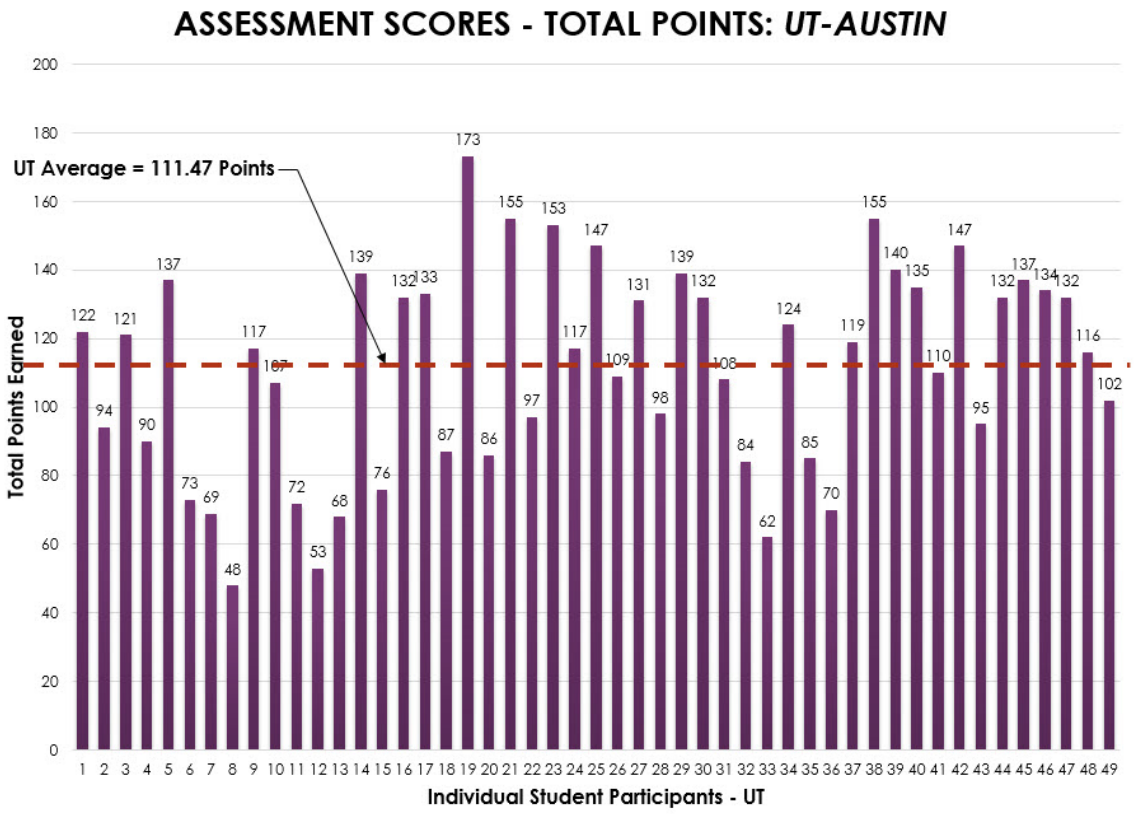



Figure 5.4: Creativity Assessment: Student Scores –The University of Texas at Austin

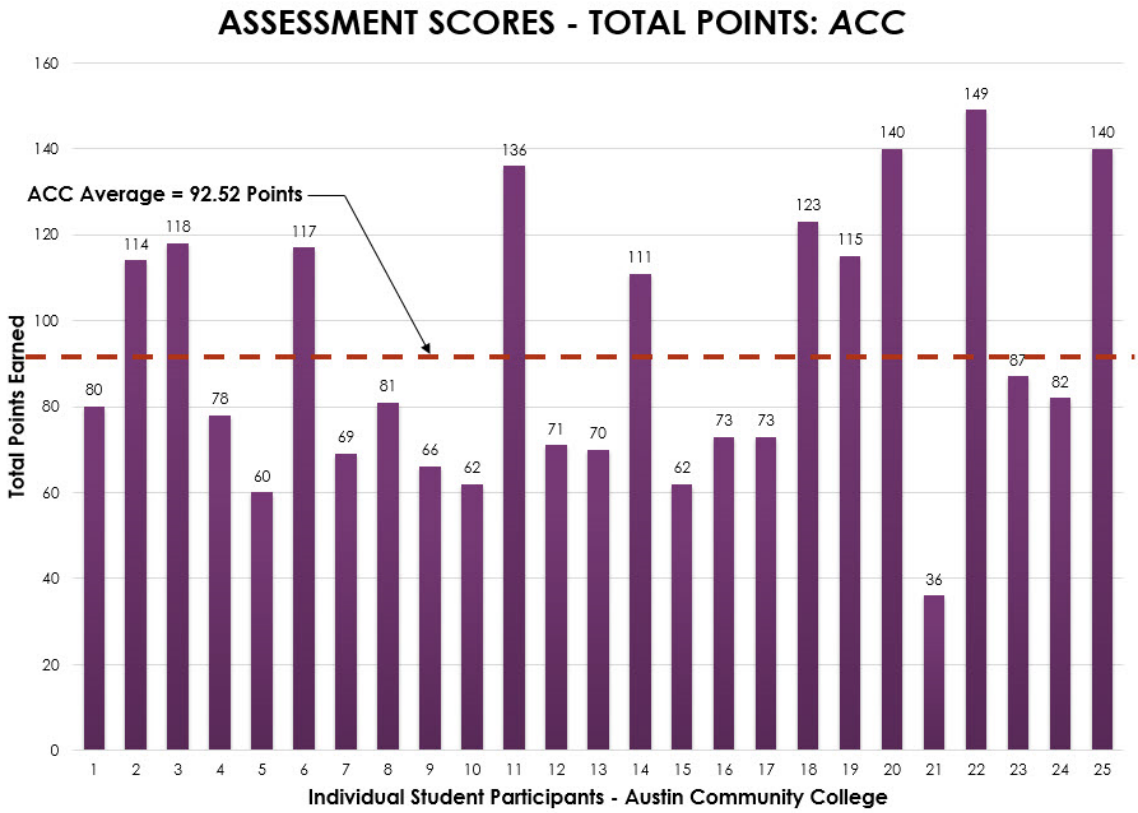



Figure 5.5: Creativity Assessment: Student Scores – Austin Community College

While comparison of the overall scores gives a general picture of the range of responses and overall performance at each school, it is also necessary to look at the responses to individual assessment questions in order to target the individual capabilities of the student groups at each school. The assessment questions are included in the Appendix section of this thesis, and the responses and school comparison of each question is listed below:

| | | | |
|---|---|---|---|
| 1. | *Assessment Question 1:* | *Professor Opinion* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 0.96 Points | |
| | Difference in Averages (in points): | 0.04 Points | ***Favors UT-Austin*** |
| 2. | *Assessment Question 2:* | *Nine Dots Drawing* | *8 Points Possible* |
| | UT Points Total – Average: | 2.24 Points | |
| | ACC Points Total – Average: | 1.48 Points | |
| | Difference in Averages (in points): | 0.76 Points | ***Favors UT-Austin*** |
| 3. | *Assessment Question 3:* | *Childhood Bedroom* | *5 Points Possible* |
| | UT Points Total – Average: | 2.98 Points | |
| | ACC Points Total – Average: | 2.32 Points | |
| | Difference in Averages (in points): | 0.66 Points | ***Favors UT-Austin*** |
| 4. | *Assessment Question 4:* | *Pencil Uses* | *6 Points Possible* |
| | UT Points Total – Average: | 4.02 Points | |
| | ACC Points Total – Average: | 3.48 Points | |
| | Difference in Averages (in points): | 0.54 Points | ***Favors UT-Austin*** |
| 5. | *Assessment Question 5:* | *'Candle' Words* | *1 Point Possible* |
| | UT Points Total – Average: | 0.67 Points | |
| | ACC Points Total – Average: | 0.72 Points | |
| | Difference in Averages (in points): | 0.05 Points | ***Favors ACC*** |
| 6. | *Assessment Question 6:* | *Bed Sheet Uses* | *6 Points Possible* |
| | UT Points Total – Average: | 3.94 Points | |
| | ACC Points Total – Average: | 4.24 Points | |
| | Difference in Averages (in points): | 0.30 Points | ***Favors ACC*** |
| 7. | *Assessment Question 7:* | *Line Drawing* | *6 Points Possible* |
| | UT Points Total – Average: | 3.39 Points | |
| | ACC Points Total – Average: | 2.56 Points | |
| | Difference in Averages (in points): | 0.83 Points | ***Favors UT-Austin*** |

| | | | |
|---|---|---|---|
| 8. | *Assessment Question 8:* | *Hobbies-Collecting* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| 9. | *Assessment Question 9:* | *Family Discussion* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| 10. | *Assessment Question 10:* | *Art Opinion 1* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| 11. | *Assessment Question 11:* | *Cat & Mouse* | *6 Points Possible* |
| | UT Points Total – Average: | 3.78 Points | |
| | ACC Points Total – Average: | 3.96 Points | |
| | Difference in Averages (in points): | 0.18 Points | ***Favors ACC*** |
| 12. | *Assessment Question 12:* | *Square Things* | *6 Points Possible* |
| | UT Points Total – Average: | 2.98 Points | |
| | ACC Points Total – Average: | 2.48 Points | |
| | Difference in Averages (in points): | 0.50 Points | ***Favors UT-Austin*** |
| 13. | *Assessment Question 13:* | *Team Preference* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| 14. | *Assessment Question 14:* | *Oval Drawing* | *8 Points Possible* |
| | UT Points Total – Average: | 3.88 Points | |
| | ACC Points Total – Average: | 2.28 Points | |
| | Difference in Averages (in points): | 1.60 Points | ***Favors UT-Austin*** |

*15.* *Assessment Question 15:* *Others' Opinions* *1 Point Possible*

| | | |
|---|---|---|
| UT Points Total – Average: | 1.00 Points | |
| ACC Points Total – Average: | 1.00 Points | |
| Difference in Averages (in points): | 0.00 Points | ***No Difference*** |

*16.* *Assessment Question 16:* *Tumor Problem* *4 Points Possible*

| | | |
|---|---|---|
| UT Points Total – Average: | 2.10 Points | |
| ACC Points Total – Average: | 1.68 Points | |
| Difference in Averages (in points): | 0.42 Points | ***Favors UT-Austin*** |

*17.* *Assessment Question 17:* *Art Opinion 2* *1 Point Possible*

| | | |
|---|---|---|
| UT Points Total – Average: | 1.00 Points | |
| ACC Points Total – Average: | 1.00 Points | |
| Difference in Averages (in points): | 0.00 Points | ***No Difference*** |

*18.* *Assessment Question 18:* *Arrival Time* *1 Point Possible*

| | | |
|---|---|---|
| UT Points Total – Average: | 1.00 Points | |
| ACC Points Total – Average: | 0.96 Points | |
| Difference in Averages (in points): | 0.04 Points | ***Favors UT-Austin*** |

*19.* *Assessment Question 19:* *'Box' Words* *1 Point Possible*

| | | |
|---|---|---|
| UT Points Total – Average: | 0.61 Points | |
| ACC Points Total – Average: | 0.64 Points | |
| Difference in Averages (in points): | 0.03 Points | ***Favors ACC*** |

*20.* *Assessment Question 20:* *'Snow' Words* *1 Point Possible*

| | | |
|---|---|---|
| UT Points Total – Average: | 0.18 Points | |
| ACC Points Total – Average: | 0.20 Points | |
| Difference in Averages (in points): | 0.02 Points | ***Favors ACC*** |

*21.* *Assessment Question 21:* *Work Time* *1 Point Possible*

| | | |
|---|---|---|
| UT Points Total – Average: | 1.02 Points | |
| ACC Points Total – Average: | 1.00 Points | |
| Difference in Averages (in points): | 0.02 Points | ***Favors UT-Austin*** |

| | | | |
|---|---|---|---|
| *22.* | *Assessment Question 22:* | *Try Anything* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| *23.* | *Assessment Question 23:* | *Art Opinion 3* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| *24.* | *Assessment Question 24:* | *Survey Purpose* | *1 Point Possible* |
| | UT Points Total – Average: | 1.00 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| *25.* | *Assessment Question 25:* | *Thumbtacks Problem* | *8 Points Possible* |
| | UT Points Total – Average: | 4.00 Points | |
| | ACC Points Total – Average: | 3.12 Points | |
| | Difference in Averages (in points): | 0.88 Points | ***Favors UT-Austin*** |
| *26.* | *Assessment Question 26:* | *Morning Beverage* | *1 Point Possible* |
| | UT Points Total – Average: | 0.94 Points | |
| | ACC Points Total – Average: | 0.92 Points | |
| | Difference in Averages (in points): | 0.02 Points | ***Favors UT-Austin*** |
| *27.* | *Assessment Question 27:* | *Two Line Drawing* | *6 Points Possible* |
| | UT Points Total – Average: | 4.08 Points | |
| | ACC Points Total – Average: | 2.24 Points | |
| | Difference in Averages (in points): | 1.84 Points | ***Favors UT-Austin*** |
| *28.* | *Assessment Question 28:* | *Art Opinion 4* | *1 Point Possible* |
| | UT Points Total – Average: | 0.98 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.02 Points | ***Favors ACC*** |

| | | | |
|---|---|---|---|
| *29.* | *Assessment Question 29:* | *'Eye' Words* | *1 Point Possible* |
| | UT Points Total – Average: | 0.04 Points | |
| | ACC Points Total – Average: | 0.00 Points | |
| | Difference in Averages (in points): | 0.04 Points | ***Favors UT-Austin*** |
| *30.* | *Assessment Question 30:* | *Group Projects* | *1 Point Possible* |
| | UT Points Total – Average: | 0.98 Points | |
| | ACC Points Total – Average: | 0.96 Points | |
| | Difference in Averages (in points): | 0.02 Points | ***Favors UT-Austin*** |
| *31.* | *Assessment Question 31:* | *Shapes Composition* | *8 Points Possible* |
| | UT Points Total – Average: | 3.61 Points | |
| | ACC Points Total – Average: | 2.68 Points | |
| | Difference in Averages (in points): | 0.93 Points | ***Favors UT-Austin*** |
| *32.* | *Assessment Question 32:* | *No More Sleep* | *4 Points Possible* |
| | UT Points Total – Average: | 2.45 Points | |
| | ACC Points Total – Average: | 1.80 Points | |
| | Difference in Averages (in points): | 0.65 Points | ***Favors UT-Austin*** |
| *33.* | *Assessment Question 33:* | *The Unknown* | *1 Point Possible* |
| | UT Points Total – Average: | 1.02 Points | |
| | ACC Points Total – Average: | 0.96 Points | |
| | Difference in Averages (in points): | 0.06 Points | ***Favors UT-Austin*** |
| *34.* | *Assessment Question 34:* | *Stairs Facts* | *6 Points Possible* |
| | UT Points Total – Average: | 4.73 Points | |
| | ACC Points Total – Average: | 4.04 Points | |
| | Difference in Averages (in points): | 0.69 Points | ***Favors UT-Austin*** |
| *35.* | *Assessment Question 35:* | *'Girl' Words* | *1 Point Possible* |
| | UT Points Total – Average: | 0.43 Points | |
| | ACC Points Total – Average: | 0.32 Points | |
| | Difference in Averages (in points): | 0.11 Points | ***Favors UT-Austin*** |

| | | | |
|---|---|---|---|
| *36.* | *Assessment Question 36:* | *Art Opinion 5* | *1 Point Possible* |
| | UT Points Total – Average: | 0.96 Points | |
| | ACC Points Total – Average: | 0.96 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| *37.* | *Assessment Question 37:* | *Drawing Completion* | *8 Points Possible* |
| | UT Points Total – Average: | 4.14 Points | |
| | ACC Points Total – Average: | 2.88 Points | |
| | Difference in Averages (in points): | 1.26 Points | ***Favors UT-Austin*** |
| *38.* | *Assessment Question 38:* | *Tire Uses* | *6 Points Possible* |
| | UT Points Total – Average: | 3.37 Points | |
| | ACC Points Total – Average: | 3.12 Points | |
| | Difference in Averages (in points): | 0.25 Points | ***Favors UT-Austin*** |
| *39.* | *Assessment Question 39:* | *Incomplete Drawing* | *6 Points Possible* |
| | UT Points Total – Average: | 2.51 Points | |
| | ACC Points Total – Average: | 1.96 Points | |
| | Difference in Averages (in points): | 0.55 Points | ***Favors UT-Austin*** |
| *40.* | *Assessment Question 40:* | *Gravity Effects* | *4 Points Possible* |
| | UT Points Total – Average: | 1.92 Points | |
| | ACC Points Total – Average: | 1.44 Points | |
| | Difference in Averages (in points): | 0.48 Points | ***Favors UT-Austin*** |
| *41.* | *Assessment Question 41:* | *Wheels Things* | *6 Points Possible* |
| | UT Points Total – Average: | 4.16 Points | |
| | ACC Points Total – Average: | 3.12 Points | |
| | Difference in Averages (in points): | 1.04 Points | ***Favors UT-Austin*** |
| *42.* | *Assessment Question 42:* | *Watch Uses* | *6 Points Possible* |
| | UT Points Total – Average: | 2.35 Points | |
| | ACC Points Total – Average: | 1.36 Points | |
| | Difference in Averages (in points): | 0.99 Points | ***Favors UT-Austin*** |

| | | | |
|---|---|---|---|
| *43.* | *Assessment Question 43:* | *Gravity Effects** | *4 Points Possible* |
| | UT Points Total – Average: | 0.00 Points | |
| | ACC Points Total – Average: | 0.00 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***Duplicate Question*** |
| *44.* | *Assessment Question 44:* | *Button Uses* | *6 Points Possible* |
| | UT Points Total – Average: | 1.94 Points | |
| | ACC Points Total – Average: | 1.28 Points | |
| | Difference in Averages (in points): | 0.66 Points | ***Favors UT-Austin*** |
| *45.* | *Assessment Question 45:* | *Milk & Meat* | *6 Points Possible* |
| | UT Points Total – Average: | 3.16 Points | |
| | ACC Points Total – Average: | 1.80 Points | |
| | Difference in Averages (in points): | 1.36 Points | ***Favors UT-Austin*** |
| *46.* | *Assessment Question 46:* | *Towers of Hanoi* | *6 Points Possible* |
| | UT Points Total – Average: | 3.94 Points | |
| | ACC Points Total – Average: | 2.92 Points | |
| | Difference in Averages (in points): | 1.02 Points | ***Favors UT-Austin*** |
| *47.* | *Assessment Question 47:* | *Art Opinion 6* | *1 Point Possible* |
| | UT Points Total – Average: | 0.96 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.04 Points | ***Favors ACC*** |
| *48.* | *Assessment Question 48:* | *Demonstration* | *1 Point Possible* |
| | UT Points Total – Average: | 0.96 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.04 Points | ***Favors ACC*** |
| *49.* | *Assessment Question 49:* | *Art Opinion 7* | *1 Point Possible* |
| | UT Points Total – Average: | 0.96 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.04 Points | ***Favors ACC*** |

| | | | |
|---|---|---|---|
| *50.* | *Assessment Question 50:* | *Problem Solving* | *1 Point Possible* |
| | UT Points Total – Average: | 0.94 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.06 Points | ***Favors ACC*** |
| *51.* | *Assessment Question 51:* | *Best Ideas* | *1 Point Possible* |
| | UT Points Total – Average: | 0.94 Points | |
| | ACC Points Total – Average: | 1.00 Points | |
| | Difference in Averages (in points): | 0.06 Points | ***Favors ACC*** |
| *52.* | *Assessment Question 52:* | *Noise Making* | *6 Points Possible* |
| | UT Points Total – Average: | 3.41 Points | |
| | ACC Points Total – Average: | 3.00 Points | |
| | Difference in Averages (in points): | 0.41 Points | ***Favors UT-Austin*** |
| *53.* | *Assessment Question 53:* | *Apple & Orange* | *6 Points Possible* |
| | UT Points Total – Average: | 2.94 Points | |
| | ACC Points Total – Average: | 2.72 Points | |
| | Difference in Averages (in points): | 0.22 Points | ***Favors UT-Austin*** |
| *54.* | *Assessment Question 54:* | *Nail Uses* | *6 Points Possible* |
| | UT Points Total – Average: | 2.10 Points | |
| | ACC Points Total – Average: | 1.24 Points | |
| | Difference in Averages (in points): | 0.86 Points | ***Favors UT-Austin*** |
| *55.* | *Assessment Question 55:* | *Humor* | *1 Point Possible* |
| | UT Points Total – Average: | 0.90 Points | |
| | ACC Points Total – Average: | 0.92 Points | |
| | Difference in Averages (in points): | 0.02 Points | ***Favors ACC*** |
| *56.* | *Assessment Question 56:* | *'Table' Words* | *1 Point Possible* |
| | UT Points Total – Average: | 0.12 Points | |
| | ACC Points Total – Average: | 0.04 Points | |
| | Difference in Averages (in points): | 0.08 Points | ***Favors UT-Austin*** |

| | | | |
|---|---|---|---|
| *57.* | *Assessment Question 57:* | *Group Creativity* | *1 Point Possible* |
| | UT Points Total – Average: | 0.92 Points | |
| | ACC Points Total – Average: | 0.88 Points | |
| | Difference in Averages (in points): | 0.04 Points | ***Favors UT-Austin*** |
| *58.* | *Assessment Question 58:* | *Bored Easily* | *1 Point Possible* |
| | UT Points Total – Average: | 0.92 Points | |
| | ACC Points Total – Average: | 0.92 Points | |
| | Difference in Averages (in points): | 0.00 Points | ***No Difference*** |
| *59.* | *Assessment Question 59:* | *Step-by-Step* | *1 Point Possible* |
| | UT Points Total – Average: | 0.88 Points | |
| | ACC Points Total – Average: | 0.92 Points | |
| | Difference in Averages (in points): | 0.04 Points | ***Favors ACC*** |

Much of the resulting data from the survey provided scattered and varied results. Where scoring patterns were visible or began to emerge based on the results of the two student groups tested, those findings of emerging result patterns are discussed here. A large number of assessment questions were given points based on the opinions of the students, and there were question responses with drawings and other creative answers that needed to be judged and assigned a point value from the test reviewer. For these questions, each test was reviewed by two reviewers and assigned a score for each question based on the average of the reviewers' scores.

With the UT student population, the responses contained a greater level of *fluency* but not necessarily *flexibility*. ACC students, perhaps due to a lack of other test-taking abilities or preparation tended to offer more flexible responses to the Alternate-Uses types of questions, offering a demonstration of a greater degree of divergent thinking.

The single question that nearly every person surveyed at both schools answered with the same response was where the student answered 'True' in response to the question: "I often wonder what my professors think of my work." This is not insignificant as it references the way in which learning takes place in the architectural design studio. That is, the grade assessment and criticism levied on final student design projects is typically subjective on the part of the professors. Because of this subjective nature of what is deemed to be the 'correct' response to design problems, students are constantly looking to the design professors to sanction students' responses to design problems as there is not another way for students to objectively determine if they 'got it right' with their design solution.

Some other minor patterns revealed a correlation between a correct response to the Nine-dot problem, a correct response to the tumor problem, arriving early to class and drinking water as the preferred beverage of choice first thing in the morning. Also, nearly everyone thought of themselves as having a sense of humor. This assessment is not a statistically significant test overall, given the participant sample size. However, in isolating specific parameters tested for and individual questions, statistically significant findings are present in isolation.

## DISCUSSION

Observations recorded by the researcher included noting the amount of discussion generated among the student groups despite telling students at both locations to work only on their own test booklet. There were higher rates of completion among the students

at UT in terms of total numbers of questions answered, but these students also relied on talking to each other and the social network of the design studio to complete the survey even though they had been given instructions to work only on their own assessment booklet.

In general, there was likely some degree of courage or confidence to complete the assessment displayed among the UT students which could be traced back to the confidence that results from already having been admitted to a university architecture program. Some ACC students may have displayed some trepidation about putting in 'wrong' or 'bad' answers on the assessment, so they skipped over a greater number of questions.

One of the limitations of this administration of the assessment is that the sample size is relatively small, so the results produced are not necessarily statistically significant for every given parameter of the assessment. However, there is inherent value in the comparison between student groups at the two school locations as this is an attempt at a real-time, on-the ground assessment of creative potential instead of speculation only.

This administration of the creativity assessment does not track the progress of students long-term, so it is not possible to see a longitudinal view of its failure or success. Because the study is not longitudinal, it is not clear at this time if the community college students will persist in their major of architecture beyond the purview of this assessment. That is, in its current format this assessment is not predictive of long-term outcomes of success in community college architecture students, such as whether or not students successfully transfer later to a NAAB-accredited university architecture program,

whether students persist in the community college architecture program or decide to pursue a different academic area of interest.

Survey Documents included as Appendices:

- *Creativity Assessment for Architecture* (blank) labeled as *'Learning Styles Assessment for Architecture'*
- Grading Rubric used for all test assessments
- Four completed test booklets: UT-Austin High Score, UT-Austin Low Score, ACC High Score, ACC Low Score

# Chapter 6: Community College Architecture Programs: *Student Success Strategies*

Because community college students represent a cross section of the region that the college serves, the natural diversity of the population is represented. This diversity offers an opportunity to introduce a broad array of students to the field of architecture. However, the structure of architectural education emphasizes the acquisition of a professional degree for architecture as a requirement for licensure. Although achievement of a terminal degree in architecture is necessary as the ultimate goal of someone who is planning to become an architect, there is also value in the benefits of community college architecture programs even though they do not offer professional architecture degrees. The focus should be on advantages of community college architecture programs and what they provide instead of what they don't. The acceptance by the architectural academy of community college architecture programs as a beneficial partner in the education of future architects will provide an increased awareness of the profession and additional access to architectural education generally.

## UNIQUE NATURE OF THE COMMUNITY COLLEGE LEARNING EXPERIENCE

For a large number of college students in the United States, community and junior colleges represent the most accessible option for higher education. As of the 2011-12 academic school year, 45% of all undergraduate students were enrolled in public two-year colleges resulting in approximately 8.3 million students. Approximately 3.3 million students were enrolled full-time, and approximately 4.8 million students were enrolled

part-time (Knapp et al., 2012). Despite the large numbers of students attending public, two-year colleges, negative connotations often remain attached to community college students and their abilities. Additionally, many community college students face barriers with regard to access to higher education generally, and architectural education specifically.

Due to the diversity of community college students' academic experience, age, culture, ethnicity, socio-economic status, and family situations, it would be a disservice to community college students to try to generalize their collective experiences with higher education. Instead, the focus here is on removing barriers of access to one, albeit relatively small area of academic interest: architectural education.

# Chapter 7: Conclusion: *Creativity and the Future of Architectural Education*

Thinking more broadly about what constitutes an architectural education may benefit a greater spectrum of future architecture students. The profession and academy of architecture must promote and enlarge the pathways to an architectural education in order to enhance the future of architecture. It doesn't hinder, but only helps, the conversation about the future of the built environment when more people and a greater cross-section of society is exposed to the fundamental concepts and ideas of architecture. If access to architecture as a profession is to increase, limiting the amount of exposure to architecture as an academic discipline is not the answer. In fact, opening up the 'architectural' conversation to many more people will help the profession to grow and evolve, becoming even more relevant and effectual in a greater number of people's lives, much like language adapts and evolves over time by those who continue to use it.

Those involved in structuring architectural design pedagogy should be focused not just on proselytizing the benefits of an architectural education to more students, but also demonstrate a willingness to embrace an interdisciplinary approach to architectural education that could enhance the future of architectural education. This will require those within the profession and accredited programs of architecture to be open to adopting methods of inclusion and pedagogical access from other disciplines, recognizing commonalities that architecture shares such as creativity. This interdisciplinarity can

include a variety of methods to cultivate creative potential in students who express an interest in architecture, especially in the community college setting.

With over 160 community college architecture programs currently operating in the United States (Coalition of Community College Architecture Programs, 2014), these programs likely will act as the first point of contact with any architecture coursework for most students. As such, these programs should be more formally integrated into the landscape of architectural education through ongoing policy efforts with the National Architectural Accrediting Board (NAAB) and the Association of Collegiate Schools of Architecture (ACSA) to facilitate transfer agreements with professional university architecture programs. This is even more critical recognizing that community colleges "account for approximately 40 percent of all enrollments in American higher education" and that "students who enroll in community colleges are more likely to be low-income, the first in their families to go to college, and members of underrepresented racial or ethnic groups" (The National Center for Public Policy and Higher Education, 2011).

In identifying talent within the population of potential architecture students, the Creativity Assessment for Architecture presented here can be further developed and modified to cultivate potential in a broad array of students. Its usefulness can potentially serve two purposes: 1) to provide evidence of potential creative aptitude in students where no other metrics of prior creative performance or other evidence exists, and 2) to develop customized curriculum for diverse cohorts of community college architecture students. An abridged version of the Creativity Assessment could be used at the beginning of each foundational design course to determine the capabilities of the

particular class, then use the gathered information to create customized design exercises targeted to address deficiencies found by the Assessment. On the part of students, understanding creativity as a capability that can be learned and developed opens new avenues of possibility for how students view their path to architectural education and beyond.

# Appendices

The following documents and student artifacts are provided as supplemental information to describe and support the *Creativity Assessment for Architecture** created for this thesis as referenced in Chapter 5: An Experiment: *Creativity Assessment for Architecture*:

- Appendix A: Creativity Assessment for Architecture* – Blank
- Appendix B: Creativity Assessment for Architecture – Grading Rubric
- Appendix C: Creativity Assessment Student Example – UT High Score
- Appendix D: Creativity Assessment Student Example – UT Low Score
- Appendix E: Creativity Assessment Student Example – ACC High Score
- Appendix F: Creativity Assessment Student Example – ACC Low Score

**Image Credit for Questions 10, 17, 23, 28, 36, 47, 49:* Art Images from the *Barron Welsh Art Scale* (BWAS, 1952), first introduced in 1952, a subset of the *Welsh Figure Preference Test* (WFPT, 1949). Reproduced from *Barron-Welsh Art Scale Manual/Sampler Set*, by F. Barron and G.S. Welsh, with H.B. Gough, W.B. Hall, and P. Bradley. Copyright © 1987, 2003, 2005 by Mind Garden, Inc. Reprinted with permission.

**Image Credit for Question 25:* Image depicting 'Candle Test' created by Gestalt psychologist Karl Duncker (1945). Reproduced and adapted from study by S. Glucksberg and R.W. Weisberg (1966). Copyright © 1966 by American Psychological Association.

**Image Credit for Question 46:* Image depicting 'Towers of Hanoi' problem. Reprinted from *TeXample.net*, by B. Damman and M. Hofmann (2010). Retrieved from http://www.texample.net. Copyright © 2010 by Berteun Damman and Martin Hofmann.

**APPENDIX A: CREATIVITY ASSESSMENT FOR ARCHITECTURE – BLANK**

STUDY NUMBER_____

# LEARNING STYLES ASSESSMENT FOR ARCHITECTURE

MASTER OF SCIENCE IN ARCHITECTURAL STUDIES (MSAS)
RESEARCH PROJECT

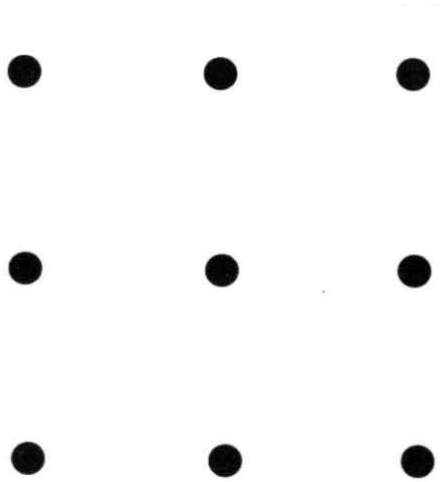
The University of Texas at Austin
Graduate School

## ***GENERAL INFORMATION & INSTRUCTIONS***

- **THANK YOU FOR TAKING PART IN THIS SURVEY**
- **WORK QUICKLY THROUGH THE QUESTIONS, AND TRY NOT TO LINGER TOO LONG ON ANY SINGLE QUESTION**
- **THERE IS A TIME LIMIT OF 40 MINUTES**
- **DO NOT WRITE YOUR NAME OR ANY OTHER PERSONAL DATA ON THE ASSESSMENT BOOKLET**
- **IF YOU ARE WILLING TO ANSWER DEMOGRAPHIC QUESTIONS, THERE IS AN OPTIONAL SET OF QUESTIONS ON THE LAST PAGE OF THE BOOKLET**

1) _____ I often wonder what my professors think of my work.
   a) True
   b) False

2) Given the nine dots shown below, connect all of the dots with FOUR straight lines without lifting your pencil from the paper.



3) Describe your childhood bedroom:

_____
_____
_____
_____

4) List as many as six possible uses for the following object:
WOODEN PENCIL (used for writing):

_____
_____
_____
_____
_____
_____

5) Review the three words below, then come up with a FOURTH word that is associated with all three words:
LIGHT - BIRTHDAY - STICK

_____

6) List as many as six possible uses for the following object:
BED SHEET (used on bed):

7) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.

8) _____ I enjoy hobbies that involve collecting things.

a) Agree
b) Undecided or Don't Know
c) Disagree

9) _____ I have had a discussion about architecture with a family member.

a) True
b) False

10) _____ I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

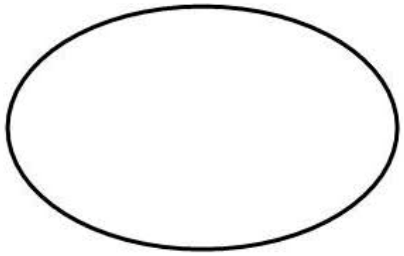
11) List all the ways in which a CAT and a MOUSE are alike:

12) Name all the SQUARE things you can think of:

13) _____ I prefer to work with others in a team rather than by myself.

a) Agree
b) Undecided or Don't Know
c) Disagree

14) Create an original drawing, incorporating the shape below, by adding any new shapes, lines, patterns, and/or words to create a scene below.



15) _____ I spend a great deal of time thinking about what other people think of me.

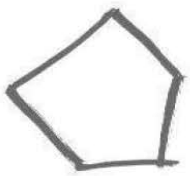
a) Agree

b) Undecided or Don't Know

c) Disagree

16) Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient; but unless the tumor is destroyed, the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays are directed at the tumor at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to the healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue? Write your solution in the lines provided below.

17) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

18) _____ I typically arrive to class _____:
a) Early
b) On time
c) Late

19) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SQUARE - CARDBOARD - OPEN

_____

20) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLAKE - MOBILE - CONE

_____

21) _____ I work best and am most focused:
a) Early in the morning
b) In the middle of the day
c) Early in the evening
d) Late at night

22) _____ I'll try anything once to see what it's like.
a) True
b) False

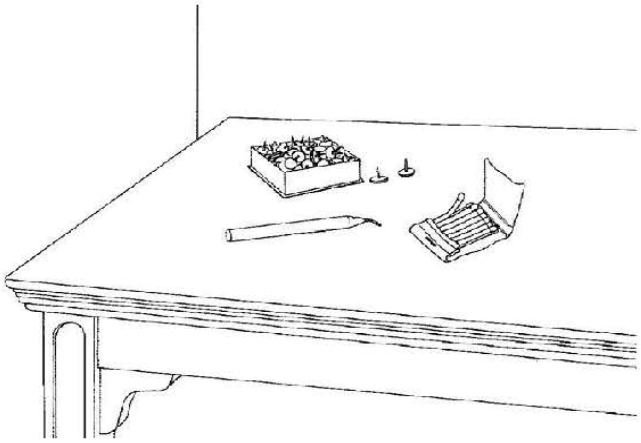
23) _____ I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

24) _____ I am wondering what the purpose of this survey is.

a) True
b) False

25) In this task, you need to figure out how to fix and light a candle on a wall (a cork board) in a way so the candle wax won't drip onto the table below. To do so, you may only use the following along with the candle: a book of matches and a box of thumbtacks. Write your solution to the problem in the lines provided below.

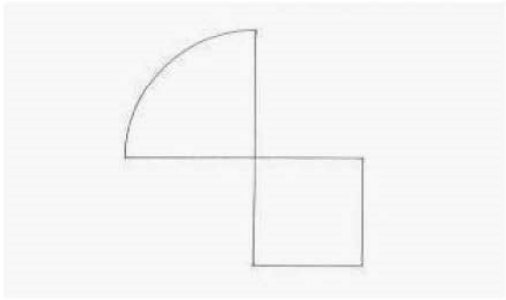


26) What beverage do you drink first thing in the morning?

_____

27) Given the four dots shown below, connect all of the dots with TWO straight lines without lifting your pencil from the paper.

28) _____ I like the image shown below.



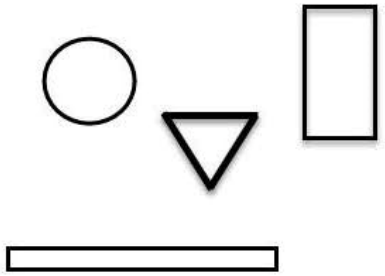
a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

29) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SHADOW - CHART - DROP

_____

30) _____ I prefer to work on projects:
a) By myself
b) With a small group of people
c) With a large group of people

31) Create an original drawing, incorporating the shapes below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



32) List all the possible consequences of people no longer needing to sleep.

_____
_____
_____
_____

33) _____ I love the excitement of the unknown.
a) True
b) False

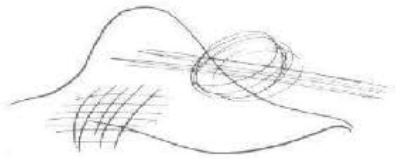
34) List three (3) good characteristics and three (3) bad characteristics about STAIRS:

_____
_____
_____
_____
_____
_____

35) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLOWER - FRIEND - SCOUT

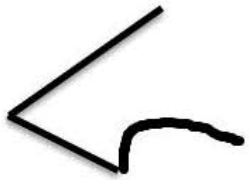
_____

36) _____ I like the image shown below.



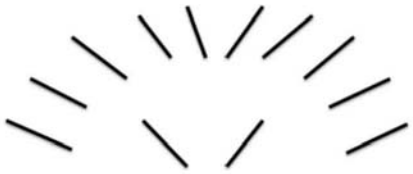
a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

37) Create an original drawing, incorporating the lines below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



38) List as many as six possible uses for the following object:
AUTOMOBILE TIRE (used on the wheel of an automobile):

39) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.



40) In what ways would life be different if gravity did not exist?

41) Name all the items you can think of that MOVE ON WHEELS.

42) List as many as six possible uses for the following object:
WATCH (used to telling time):

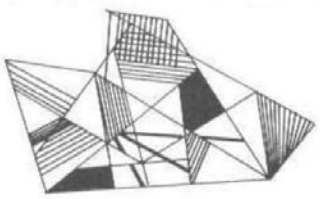
43) In what ways would life be different if gravity did not exist?

44) List as many as six possible uses for the following object:
BUTTON (used to fasten things):

45) List all the ways in which MILK and MEAT are alike:

46)
Three vertical rods are shown below with three disks of different sizes which can slide onto any rod. The disks are now in a neat stack in ascending order of size on the rod at the left, with the smallest disk at the top, thus making a conical shape.
The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:
Only one disk can be moved at a time.Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack.No disk may be placed on top of a smaller disk.
Write your solution in the lines provided below.

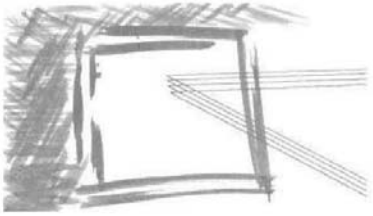
47) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

48) _____ How important is it for you to see someone demonstrating a task in order for you to learn it?
a) Very Important
b) Somewhat Important
c) Somewhat Unimportant
d) Not at all Important

49) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

50) _____ I sometimes feel as if others around me reach a solution to a problem sooner than I do.

a) True
b) False

51) _____ I often get my best ideas when doing nothing in particular.
a) Agree
b) Undecided or Don't Know
c) Disagree

52) Name all the items you can think of that MAKE A NOISE.

53) List all the ways in which an APPLE and an ORANGE are alike:

54) List as many as six possible uses for the following object:
NAIL (used for fastening):

55) _____ I consider myself to be a humorous person.
a) Agree
b) Undecided or Don't Know
c) Disagree

56) Review the three words below, then come up with a FOURTH word that is associated with all three words:
TENNIS - ROUND - MANNERS

57) _____ In order to be creative, it helps me to be with a group of people I already know or am familiar with.
a) True
b) False

58) _____ I get bored easily.
a) True
b) False

59) _____ I feel that a logical step-by-step method is best for solving problems.
a) Agree
b) Undecided or Don't Know
c) Disagree

***DEMOGRAPHIC INFORMATION (OPTIONAL)***

- **AGE_____**
- **GENDER_____**
- **RACE / ETHNICITY_____**

## APPENDIX B: CREATIVITY ASSESSMENT FOR ARCHITECTURE – GRADING RUBRIC

LEARNING STYLES ASSESSMENT FOR ARCHITECTURE

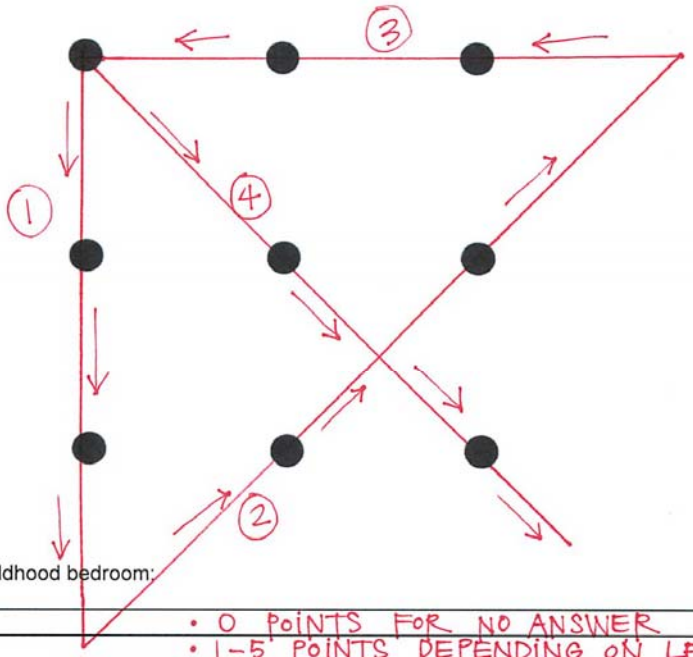
GRADING RUBRIC

1) _____ I often wonder what my professors think of my work.
   a) True
   b) False

- ANY ANSWER IS CORRECT
- 1 POINT FOR ANY ANSWER
- 0 POINTS IF LEFT BLANK

2) Given the nine dots shown below, connect all of the dots with FOUR straight lines without lifting your pencil from the paper.

- UP TO 8 POINTS POSSIBLE DEPENDING ON WHICH PARTS OF THE SOLUTION ARE CORRECT




3) Describe your childhood bedroom:

- 0 POINTS FOR NO ANSWER
- 1-5 POINTS DEPENDING ON LEVEL OF DETAIL, INVENTIVENESS AND ELABORATION

4) List as many as six possible uses for the following object:
WOODEN PENCIL (used for writing):

- UP TO 6 POINTS POSSIBLE DEPENDING ON NUMBER AND INVENTIVENESS OF RESPONSES

5) Review the three words below, then come up with a FOURTH word that is associated with all three words:
LIGHT - BIRTHDAY - STICK

- 0 POINTS FOR NO ANSWER
- 1 POINT FOR CORRECT ANSWER : CANDLE

6) List as many as six possible uses for the following object:
BED SHEET (used on bed):

- UP TO 6 POINTS POSSIBLE DEPENDING ON NUMBER AND INVENTIVENESS OF RESPONSES

7) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.

- 1-2 POINTS FOR GIVING THE DRAWING A TITLE AND THE LEVEL OF ORIGINALITY OF THE TITLE
- 1-4 POINTS POSSIBLE FOR THE DRAWING'S DESCRIPTION
- UP TO 6 POINTS POSSIBLE FOR THE ENTIRE QUESTION

8) _____ I enjoy hobbies that involve collecting things.

a) Agree
b) Undecided or Don't Know
c) Disagree

- 1 POINT FOR ANY ANSWER

9) _____ I have had a discussion about architecture with a family member.

a) True
b) False

- 1 POINT FOR ANY ANSWER

10) _____ I like the image shown below.

• 1 POINT FOR ANY ANSWER

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

11) List all the ways in which a CAT and a MOUSE are alike:

• 1 POINT FOR EACH UNIQUE RESPONSE
• AWARD AS MANY POINTS AS RESPONSES

12) Name all the SQUARE things you can think of:

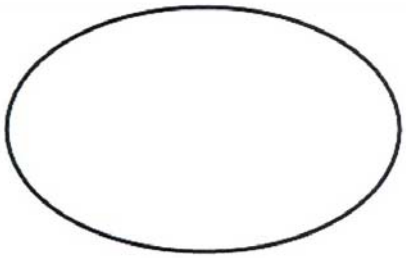
• 1 POINT FOR EACH UNIQUE, PLAUSIBLE RESPONSE
• AWARD AS MANY POINTS AS RESPONSES

13) _____ I prefer to work with others in a team rather than by myself.

a) Agree
b) Undecided or Don't Know
c) Disagree

• 1 POINT FOR ANY ANSWER

14) Create an original drawing, incorporating the shape below, by adding any new shapes, lines, patterns, and/or words to create a scene below.



• UP TO 8 POINTS POSSIBLE DEPENDING ON CREATIVITY OF THE DRAWING

15) _____ I spend a great deal of time thinking about what other people think of me.

a) Agree
b) Undecided or Don't Know
c) Disagree

• 1 POINT FOR ANY ANSWER

16) Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient; but unless the tumor is destroyed, the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays are directed at the tumor at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to the healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue? Write your solution in the lines provided below.

• UP TO 4 POINTS POSSIBLE DEPENDING ON INVENTIVENESS & PLAUSIBILITY OF THE RESPONSE

17) _____ I like the image shown below.

• 1 POINT FOR ANY ANSWER

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

18) _____ I typically arrive to class _____:

a) Early
b) On time
c) Late

• 1 POINT FOR ANY ANSWER

19) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SQUARE - CARDBOARD - OPEN

• 1 POINT FOR CORRECT ANSWER: BOX

20) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLAKE - MOBILE - CONE

• 1 POINT FOR CORRECT ANSWER: SNOW

21) _____ I work best and am most focused:

a) Early in the morning
b) In the middle of the day
c) Early in the evening
d) Late at night

• 1 POINT FOR ANY ANSWER

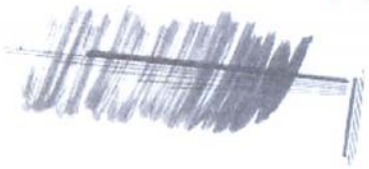
22) _____ I'll try anything once to see what it's like.

a) True
b) False

• 1 POINT FOR ANY ANSWER

23) _____ I like the image shown below.

• 1 POINT FOR ANY ANSWER



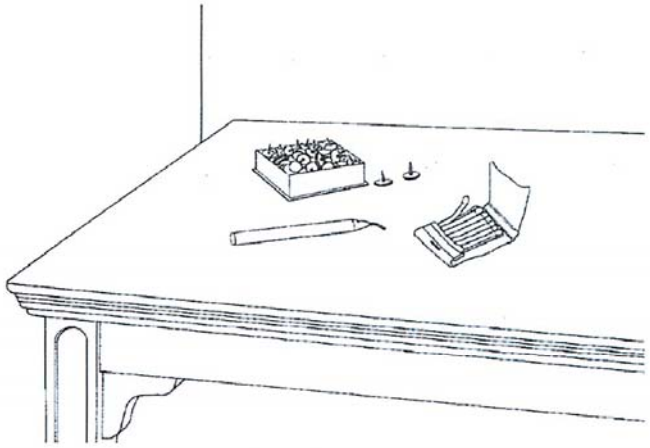
a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

24) _____ I am wondering what the purpose of this survey is.

a) True
b) False

• 1 POINT FOR ANY ANSWER

25) In this task, you need to figure out how to fix and light a candle on a wall (a cork board) in a way so the candle wax won't drip onto the table below. To do so, you may only use the following along with the candle: a book of matches and a box of thumbtacks. Write your solution to the problem in the lines provided below.



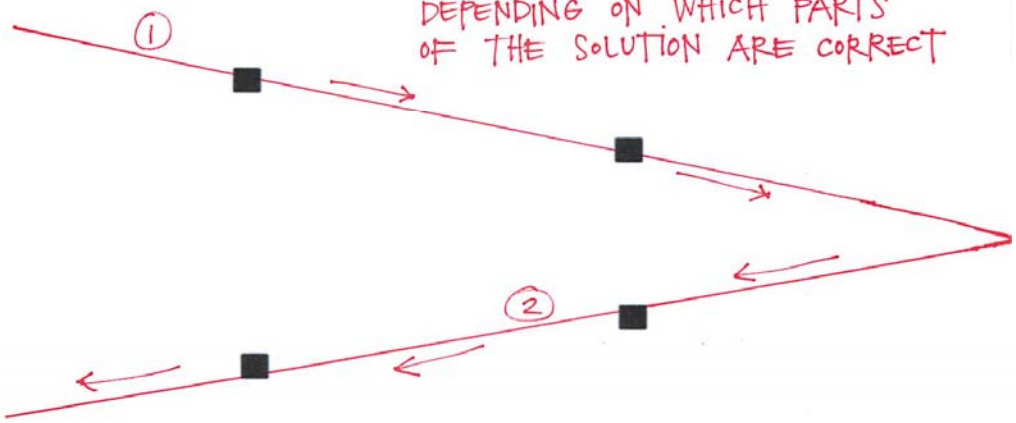
• UP TO 8 POINTS POSSIBLE DEPENDING ON CREATIVITY, INVENTIVENESS & PLAUSIBILITY OF THE RESPONSE

26) What beverage do you drink first thing in the morning?

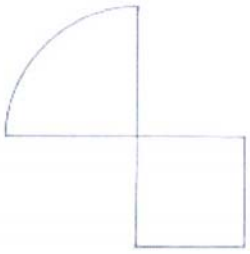
• 1 POINT FOR ANY ANSWER

27) Given the four dots shown below, connect all of the dots with TWO straight lines without lifting your pencil from the paper.

• UP TO 6 POINTS POSSIBLE DEPENDING ON WHICH PARTS OF THE SOLUTION ARE CORRECT




28) _____ I like the image shown below.



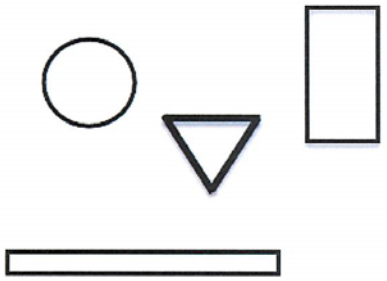
• 1 POINT FOR ANY ANSWER

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

29) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SHADOW - CHART - DROP
• 1 POINT FOR CORRECT ANSWER: EYE

30) _____ I prefer to work on projects:
a) By myself
b) With a small group of people
c) With a large group of people
• 1 POINT FOR ANY ANSWER

31) Create an original drawing, incorporating the shapes below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



• UP TO 8 POINTS POSSIBLE DEPENDING ON CREATIVITY OF THE DRAWING

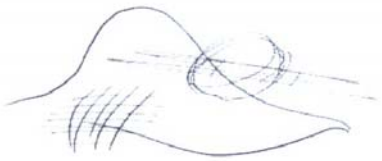
32) List all the possible consequences of people no longer needing to sleep.
• UP TO 4 POINTS POSSIBLE DEPENDING ON INVENTIVENESS OF RESPONSE

33) _____ I love the excitement of the unknown.
a) True
b) False
• 1 POINT FOR ANY ANSWER

34) List three (3) good characteristics and three (3) bad characteristics about STAIRS:
• UP TO 6 POINTS POSSIBLE DEPENDING ON LEVEL OF DETAIL AND ELABORATION

35) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLOWER - FRIEND - SCOUT
• 1 POINT FOR CORRECT ANSWER: GIRL

36) _____ I like the image shown below.



• 1 POINT FOR ANY ANSWER

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

37) Create an original drawing, incorporating the lines below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.

• UP TO 8 POINTS POSSIBLE DEPENDING ON CREATIVITY OF THE DRAWING

38) List as many as six possible uses for the following object:
AUTOMOBILE TIRE (used on the wheel of an automobile):

• UP TO 6 POINTS POSSIBLE DEPENDING ON NUMBER AND INVENTIVENESS OF RESPONSES

39) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.

- 1-2 POINTS FOR GIVING THE DRAWING A TITLE AND THE LEVEL OF ORIGINALITY OF THE TITLE
- 1-4 POINTS POSSIBLE FOR THE DRAWING'S DESCRIPTION
- UP TO 6 POINTS POSSIBLE FOR THE ENTIRE QUESTION

40) In what ways would life be different if gravity did not exist?

- UP TO 4 POINTS POSSIBLE DEPENDING ON INVENTIVENESS OF RESPONSE

41) Name all the items you can think of that MOVE ON WHEELS.

- 1 POINT FOR EACH UNIQUE, PLAUSIBLE RESPONSE
- AWARD AS MANY POINTS AS VALID RESPONSES

42) List as many as six possible uses for the following object:
WATCH (used to telling time):

- UP TO 6 POINTS POSSIBLE DEPENDING ON NUMBER AND INVENTIVENESS OF RESPONSES

43) In what ways would life be different if gravity did not exist?

- UP TO 4 POINTS POSSIBLE

44) List as many as six possible uses for the following object:
BUTTON (used to fasten things);

- UP TO 6 POINTS POSSIBLE DEPENDING ON NUMBER AND INVENTIVENESS OF RESPONSES

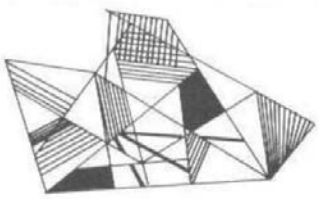
45) List all the ways in which MILK and MEAT are alike:

- 1 POINT FOR EACH UNIQUE, PLAUSIBLE RESPONSE
- AWARD AS MANY POINTS AS RESPONSES

46)
Three vertical rods are shown below with three disks of different sizes which can slide onto any rod. The disks are now in a neat stack in ascending order of size on the rod at the left, with the smallest disk at the top, thus making a conical shape.
The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules: Only one disk can be moved at a time.Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack.No disk may be placed on top of a smaller disk.
Write your solution in the lines provided below.


- UP TO 6 POINTS POSSIBLE
- MUST DEMONSTRATE & OUTLINE A STEP-BY-STEP SOLUTION TO THE PROBLEM

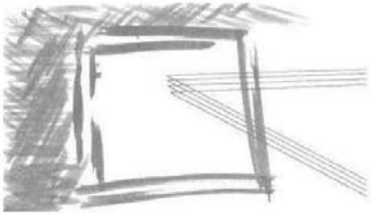
47) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

48) _____ How important is it for you to see someone demonstrating a task in order for you to learn it?
a) Very Important
b) Somewhat Important
c) Somewhat Unimportant
d) Not at all Important

49) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

50) _____ I sometimes feel as if others around me reach a solution to a problem sooner than I do.

a) True
b) False

51) _____ I often get my best ideas when doing nothing in particular.
a) Agree
b) Undecided or Don't Know
c) Disagree

52) Name all the items you can think of that MAKE A NOISE.
- 1 POINT FOR EACH UNIQUE RESPONSE
- AWARD AS MANY POINTS AS RESPONSES

53) List all the ways in which an APPLE and an ORANGE are alike:
- 1 POINT FOR EACH PLAUSIBLE RESPONSE

54) List as many as six possible uses for the following object:
NAIL (used for fastening):
- UP TO 6 POINTS POSSIBLE DEPENDING ON NUMBER AND INVENTIVENESS OF RESPONSES

55) _____ I consider myself to be a humorous person.
a) Agree
b) Undecided or Don't Know
c) Disagree
- 1 POINT FOR ANY ANSWER

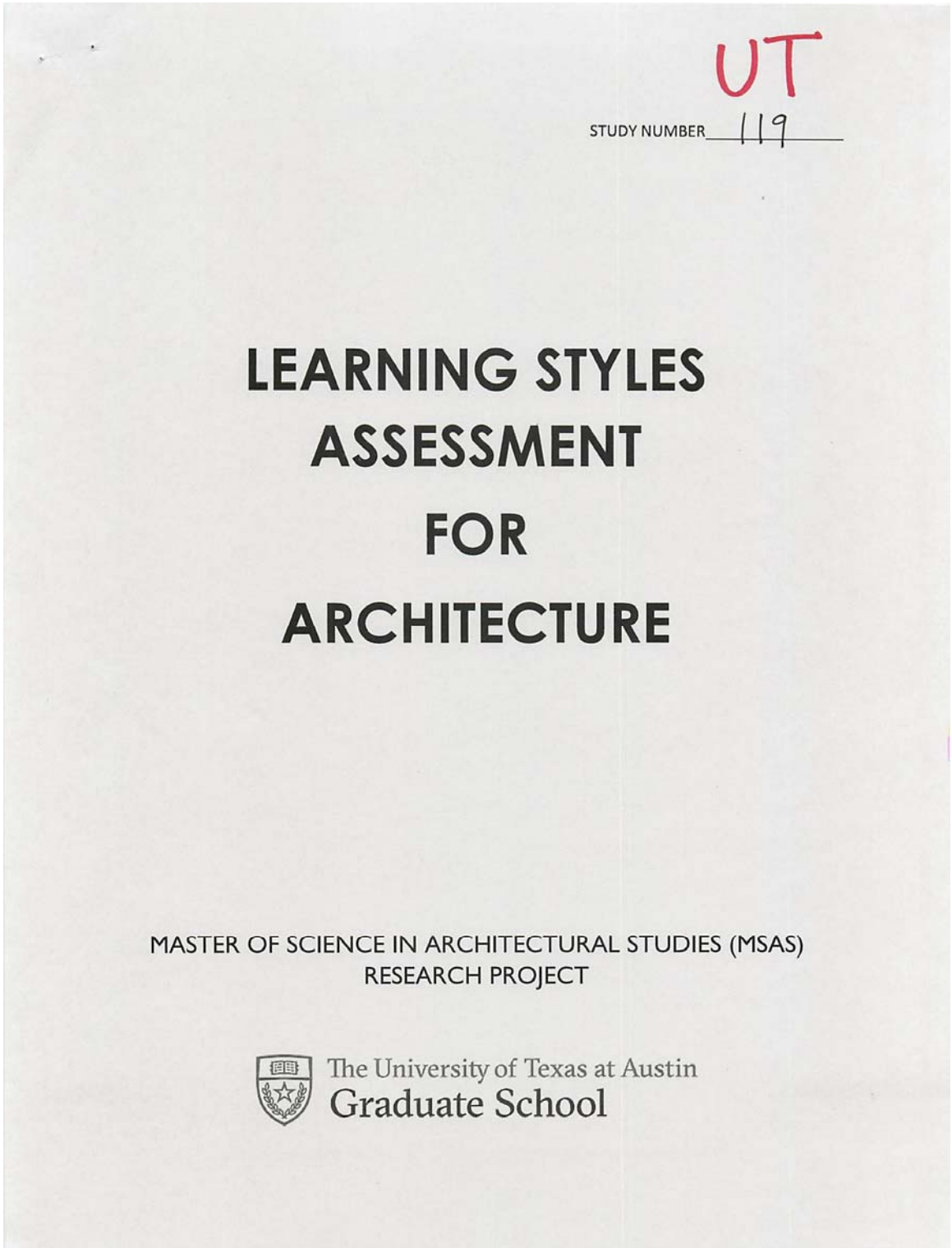
56) Review the three words below, then come up with a FOURTH word that is associated with all three words:
TENNIS - ROUND - MANNERS
- 1 POINT FOR CORRECT ANSWER: TABLE

57) _____ In order to be creative, it helps me to be with a group of people I already know or am familiar with.
a) True
b) False
- 1 POINT FOR ANY ANSWER

58) _____ I get bored easily.
a) True
b) False
- 1 POINT FOR ANY ANSWER

59) _____ I feel that a logical step-by-step method is best for solving problems.
a) Agree
b) Undecided or Don't Know
c) Disagree
- 1 POINT FOR ANY ANSWER

## APPENDIX C: CREATIVITY ASSESSMENT STUDENT EXAMPLE – UT HIGH SCORE



UT

STUDY NUMBER 119

# LEARNING STYLES ASSESSMENT FOR ARCHITECTURE

MASTER OF SCIENCE IN ARCHITECTURAL STUDIES (MSAS)
RESEARCH PROJECT

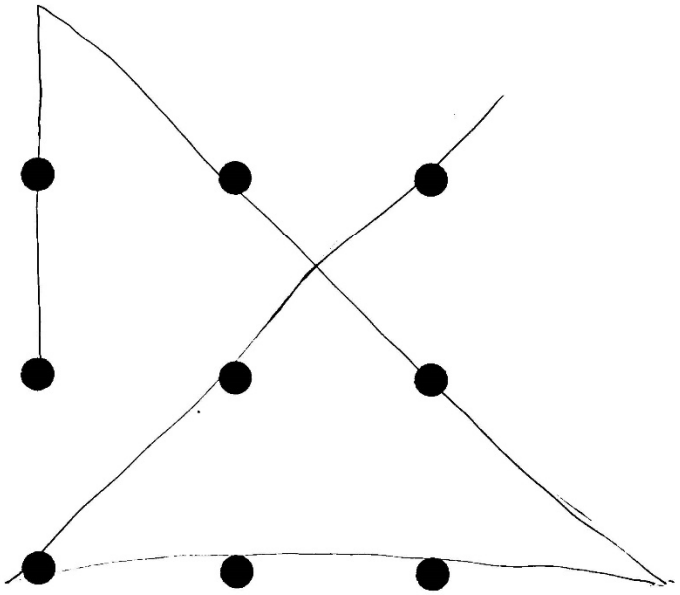
The University of Texas at Austin
Graduate School

## ***GENERAL INFORMATION & INSTRUCTIONS***

- **THANK YOU FOR TAKING PART IN THIS SURVEY**
- **WORK QUICKLY THROUGH THE QUESTIONS, AND TRY NOT TO LINGER TOO LONG ON ANY SINGLE QUESTIONS**
- **THERE IS A TIME LIMIT OF 40 MINUTES**
- **DO NOT WRITE YOUR NAME OR ANY OTHER PERSONAL DATA ON THE ASSESSMENT BOOKLET**
- **IF YOU ARE WILLING TO ANSWER DEMOGRAPHIC QUESTIONS, THERE IS AN OPTIONAL SET OF QUESTIONS ON THE LAST PAGE OF THE BOOKLET**

1) __A__ I often wonder what my professors think of my work.
   a) True
   b) False

2) Given the nine dots shown below, connect all of the dots with FOUR straight lines without lifting your pencil from the paper.



3) Describe your childhood bedroom:
I moved very frequently as a child, but the bedroom I identify the most with had blue walls, a small attached bathroom, and a walk in closet/passageway that led to what we called a "secret room", a small playroom with an opening that overlooked the great room of the house.

4) List as many as six possible uses for the following object:
WOODEN PENCIL (used for writing):
- twirling
- writing
- erasing
- Stabbing
- dowel for roasting
- skewer

5) Review the three words below, then come up with a FOURTH word that is associated with all three words:
LIGHT - BIRTHDAY - STICK
match

6) List as many as six possible uses for the following object:
BED SHEET (used on bed):

- ghost costume
- toga
- parachute
- prison escape
- warmth
- cape

7) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.

- heart rate monitor
- mountain landscape
- electric current
- jagged teeth

Title: "Peaks and Valleys"

8) a I enjoy hobbies that involve collecting things.
(a) Agree
b) Undecided or Don't Know
c) Disagree

9) a I have had a discussion about architecture with a family member.

(a) True
b) False

10) C I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

11) List all the ways in which a CAT and a MOUSE are alike:

- mammals
- have long tails
- furry
- kept as pets
- skittish nature / cautious
- cute
- quadripedal

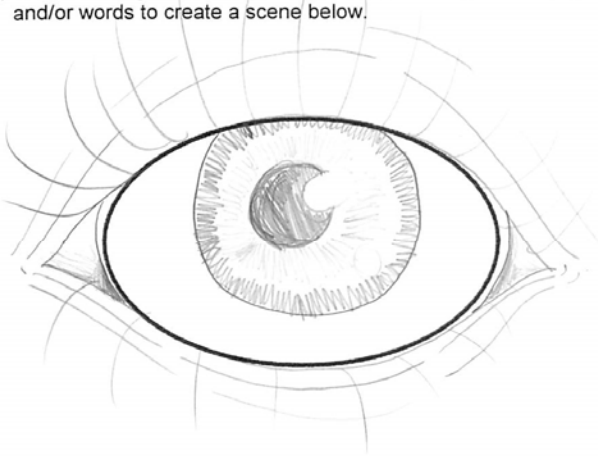
12) Name all the SQUARE things you can think of:

- town square
- box
- windows
- acoustic panels
- TV
- post it Note

13) C I prefer to work with others in a team rather than by myself.

a) Agree
b) Undecided or Don't Know
c) Disagree

14) Create an original drawing, incorporating the shape below, by adding any new shapes, lines, patterns, and/or words to create a scene below.



15) a I spend a great deal of time thinking about what other people think of me.

(a) Agree

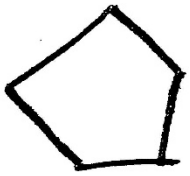
b) Undecided or Don't Know

c) Disagree

16) Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient; but unless the tumor is destroyed, the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays are directed at the tumor at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to the healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue? Write your solution in the lines provided below.

Cut open the patient to expose the tumor, ensuring there is no other tissue in front of it. Then, place a small mirror right in front of the tumor. Hopefully the ray will destroy the mirror and still hit the tumor, but enough of the ray will be reflected that the damage to the tissue behind the tumor would be minimized.

17) C I like the image shown below.



a) Agree
b) Undecided or Don't Know
(c) Disagree
d) No Opinion

18) b I typically arrive to class _____:
a) Early
(b) On time
c) Late

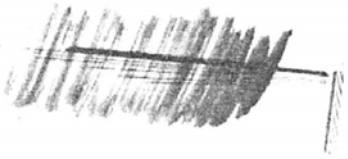
19) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SQUARE - CARDBOARD - OPEN
box

20) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLAKE - MOBILE - CONE
shaved ice food truck

21) b I work best and am most focused:
a) Early in the morning
(b) In the middle of the day
c) Early in the evening
d) Late at night

22) b I'll try anything once to see what it's like.
a) True
(b) False

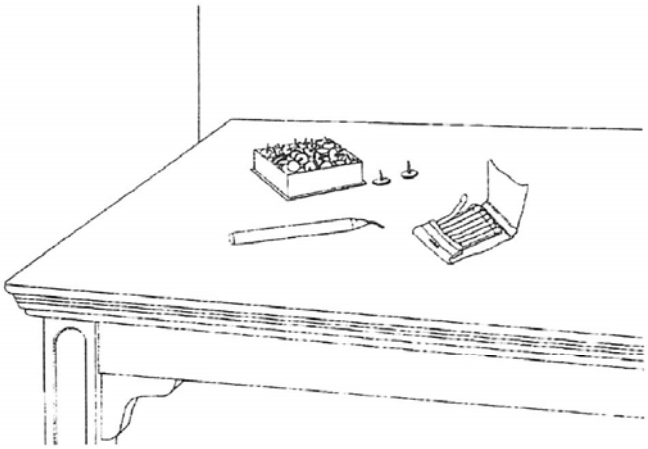
23) b I like the image shown below.



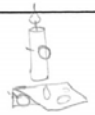
a) Agree
(b) Undecided or Don't Know
c) Disagree
d) No Opinion

24) a I am wondering what the purpose of this survey is.
(a) True
b) False

25) In this task, you need to figure out how to fix and light a candle on a wall (a cork board) in a way so the candle wax won't drip onto the table below. To do so, you may only use the following along with the candle: a book of matches and a box of thumbtacks. Write your solution to the problem in the lines provided below.

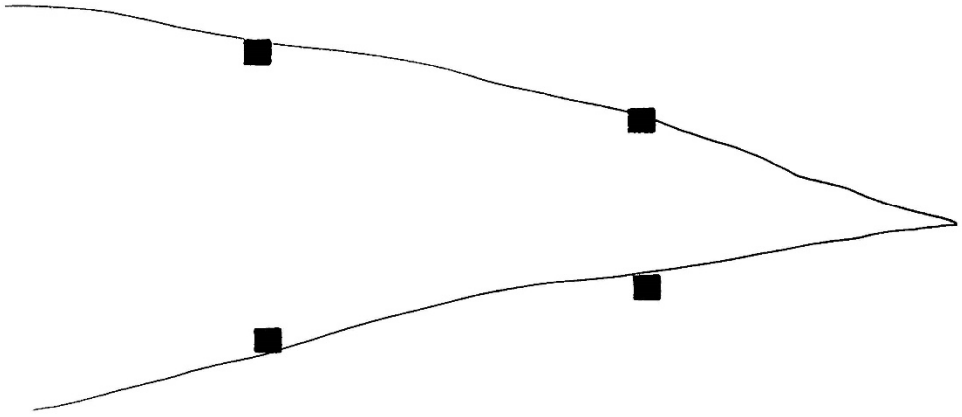


Put a tack through the candle vertically into the wall so it is positioned like this: Then, empty out the matchbook and fold it so that it can be tacked horizontally under the candle, forming a platform to catch the wax. Then light the candle.



26) What beverage do you drink first thing in the morning?
water

27) Given the four dots shown below, connect all of the dots with TWO straight lines without lifting your pencil from the paper.



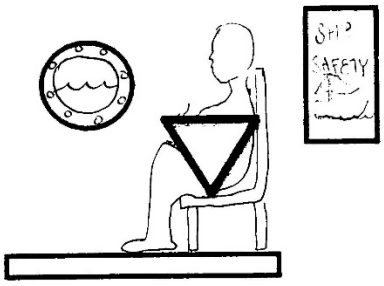
28) ok I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

29) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SHADOW - CHART - DROP
InDesign

30) a I prefer to work on projects:
(a) By myself
b) With a small group of people
c) With a large group of people

31) Create an original drawing, incorporating the shapes below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.




32) List all the possible consequences of people no longer needing to sleep.
- expanded hours for commercial establishments
- outpouring of creativity
- possible new labor laws concerning hours working
- increase in crime

33) b I love the excitement of the unknown.
a) True
(b) False

34) List three (3) good characteristics and three (3) bad characteristics about STAIRS:

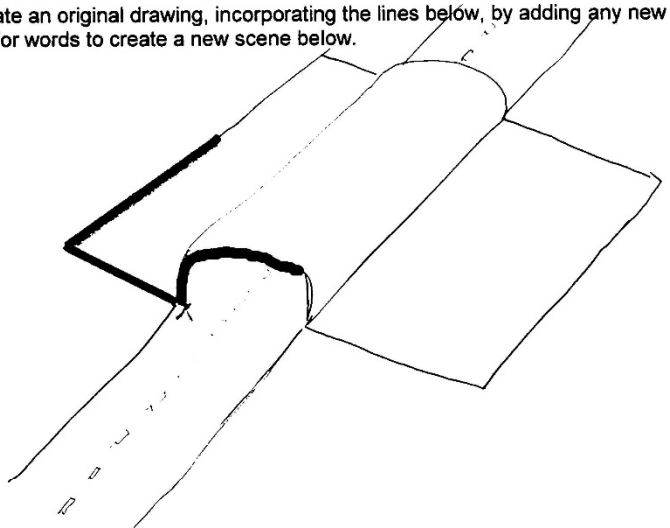
| Good: | bad: |
|---|---|
| · space-efficient | · inaccessible to people with disabilities |
| · simple | · energy-inefficient |
| · adaptable | · repetitive |

35) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLOWER - FRIEND - SCOUT
Girl Scouts

36) C I like the image shown below.

a) Agree
b) Undecided or Don't Know
(c) Disagree
d) No Opinion

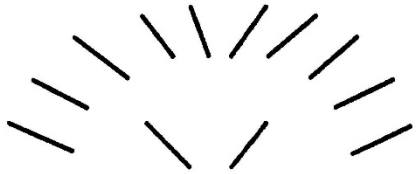
37) Create an original drawing, incorporating the lines below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



38) List as many as six possible uses for the following object:
AUTOMOBILE TIRE (used on the wheel of an automobile):

- tire swing
- wheel
- planter
- seating
- scrap rubber
- building unit

39) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.



Title: Collection of Rays

- angry hedgehog
- spilled angelhair pasta
- sunbeams

40) In what ways would life be different if gravity did not exist?

If gravity did not exist at all, planets would never have formed at all and the universe would be completely different.

41) Name all the items you can think of that MOVE ON WHEELS.

- cars
- chariots
- rollerskates
- trucks
- bikes
- buses
- scooters
- rolling doors
- skateboards
- planes

42) List as many as six possible uses for the following object:
WATCH (used to telling time):

- stopwatch / timer
- displaying the time
- bartering tool
- gift
- displaying status to others
- scrap parts

43) In what ways would life be different if gravity did not exist?

see # 40

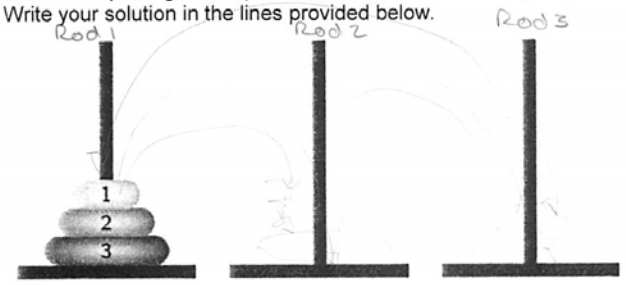
44) List as many as six possible uses for the following object:
BUTTON (used to fasten things):

- fastening clothes
- arts & crafts
- collage
- decoration
- ornamentation
- substitute for lost game pieces

45) List all the ways in which MILK and MEAT are alike:

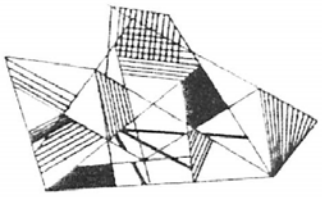
- animal byproducts • edible • provide nourishment
- not very good environmental impact
- high fat
- vegans don't eat either
- both can come from cows
- organic materials

46)
Three vertical rods are shown below with three disks of different sizes which can slide onto any rod. The disks are now in a neat stack in ascending order of size on the rod at the left, with the smallest disk at the top, thus making a conical shape.
The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules: Only one disk can be moved at a time.Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack.No disk may be placed on top of a smaller disk.
Write your solution in the lines provided below.




First, move Disc 1 to Rod 2. Then, move Disc 2 to Rod 3. Then, place Disc 1 on top of Disc 2 on Rod 3. Then, move Disc 3 to rod 3. Then move Disc 1 back to Rod 1. Move Disc 2 on top of Disc 3 on rod 3, then Disc 1 on top of that.

47) a I like the image shown below.

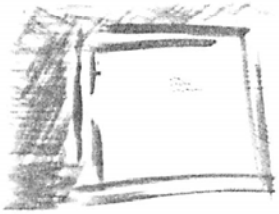


a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

48) b How important is it for you to see someone demonstrating a task in order for you to learn it?

a) Very Important
b) Somewhat Important
c) Somewhat Unimportant
d) Not at all Important

49) C I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

50) b I sometimes feel as if others around me reach a solution to a problem sooner than I do.

a) True
b) False

51) C I often get my best ideas when doing nothing in particular.

a) Agree
b) Undecided or Don't Know
c) Disagree

52) Name all the items you can think of that MAKE A NOISE.
- humans
- many animals
- anything falling
- any musical instrument
- any object being struck against another
- footsteps
- fire
- water

53) List all the ways in which an APPLE and an ORANGE are alike:
- edible
- fruit
- warm color
- has both skin & flesh
- organic material
- has seeds

54) List as many as six possible uses for the following object:
NAIL (used for fastening):
- attaching objects together
- stabbing
- stopping birds from roosting on a surface
- attaching objects to a wall
- hanging things

55) a I consider myself to be a humorous person.
(a) Agree
b) Undecided or Don't Know
c) Disagree

56) Review the three words below, then come up with a FOURTH word that is associated with all three words:
TENNIS - ROUND - MANNERS
graceful winner

57) a In order to be creative, it helps me to be with a group of people I already know or am familiar with.
(a) True
b) False

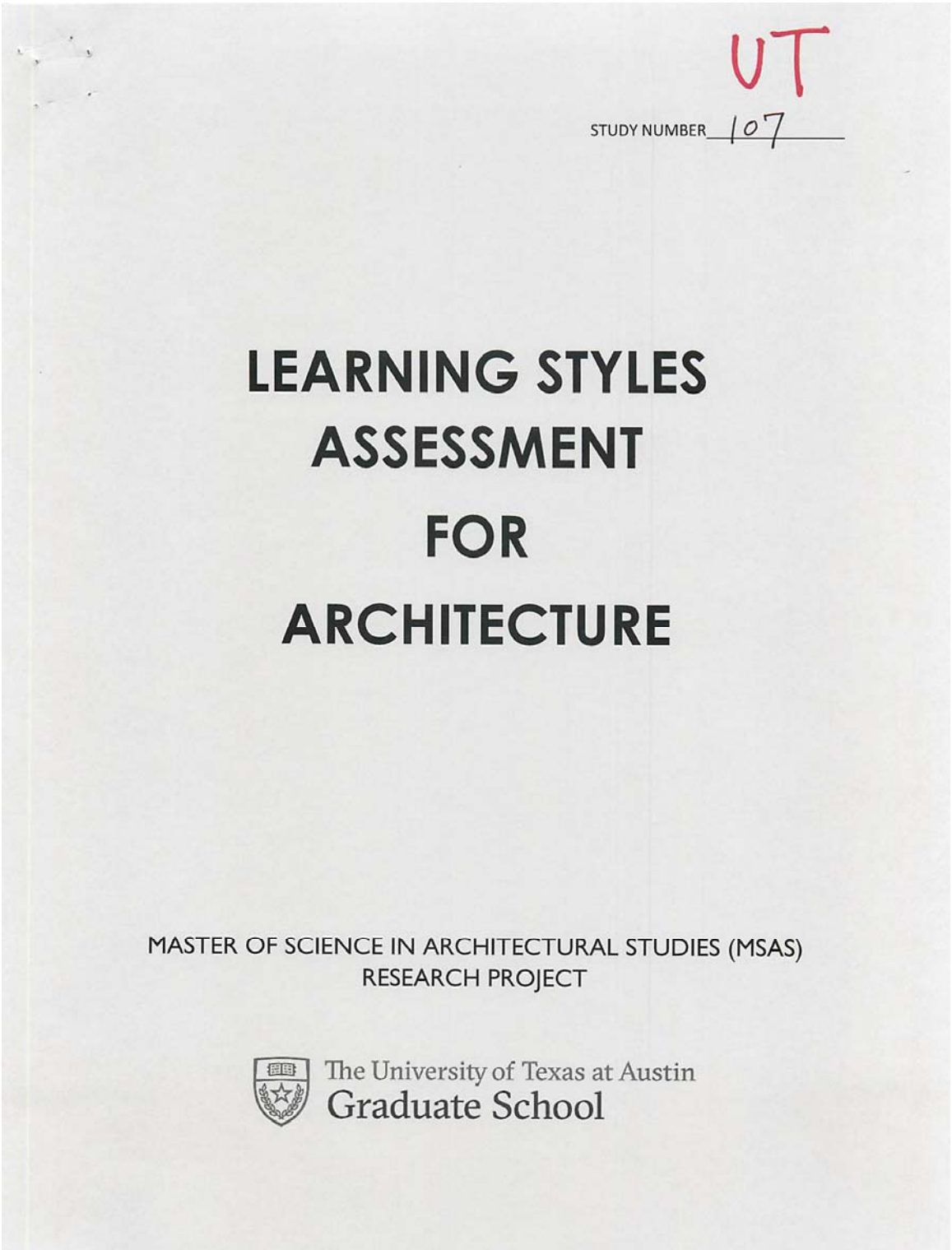
58) a I get bored easily.
(a) True
b) False

59) a I feel that a logical step-by-step method is best for solving problems.
(a) Agree
b) Undecided or Don't Know
c) Disagree

***DEMOGRAPHIC INFORMATION (OPTIONAL)***

- **AGE** 19
- **GENDER** Female
- **RACE / ETHNICITY** White

## APPENDIX D: CREATIVITY ASSESSMENT STUDENT EXAMPLE – UT LOW SCORE



UT

STUDY NUMBER 107

# LEARNING STYLES ASSESSMENT FOR ARCHITECTURE

MASTER OF SCIENCE IN ARCHITECTURAL STUDIES (MSAS)
RESEARCH PROJECT

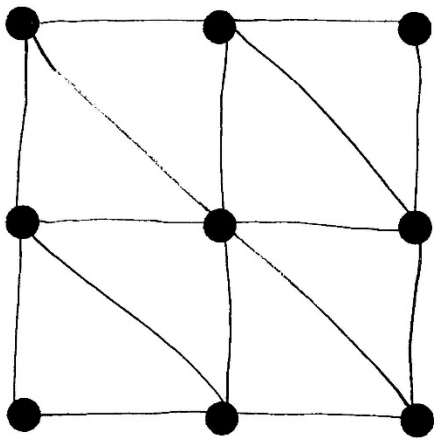
The University of Texas at Austin
Graduate School

## ***GENERAL INFORMATION & INSTRUCTIONS***

- **THANK YOU FOR TAKING PART IN THIS SURVEY**
- **WORK QUICKLY THROUGH THE QUESTIONS, AND TRY NOT TO LINGER TOO LONG ON ANY SINGLE QUESTIONS**
- **THERE IS A TIME LIMIT OF 40 MINUTES**
- **DO NOT WRITE YOUR NAME OR ANY OTHER PERSONAL DATA ON THE ASSESSMENT BOOKLET**
- **IF YOU ARE WILLING TO ANSWER DEMOGRAPHIC QUESTIONS, THERE IS AN OPTIONAL SET OF QUESTIONS ON THE LAST PAGE OF THE BOOKLET**

1) a) True I often wonder what my professors think of my work.
   b) False

2) Given the nine dots shown below, connect all of the dots with FOUR straight lines without lifting your pencil from the paper.



3) Describe your childhood bedroom:
Very homely

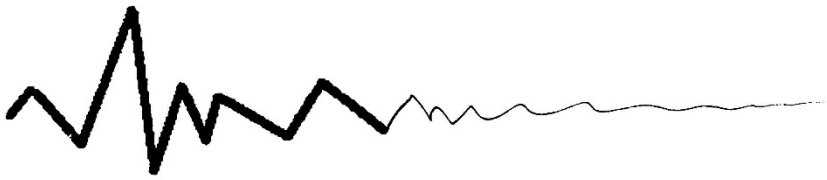
4) List as many as six possible uses for the following object:
WOODEN PENCIL (used for writing):
- Drawing
- Measuring
- Posing
- Basswood
- Erase

5) Review the three words below, then come up with a FOURTH word that is associated with all three words:
LIGHT - BIRTHDAY - STICK – Basswood

6) List as many as six possible uses for the following object:
BED SHEET (used on bed):

- Cold
- Love

7) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.



8) (a) I enjoy hobbies that involve collecting things.
a) Agree
b) Undecided or Don't Know
c) Disagree

9) (a) I have had a discussion about architecture with a family member.
a) True
b) False

10) _____ I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

11) List all the ways in which a CAT and a MOUSE are alike:

They have tails

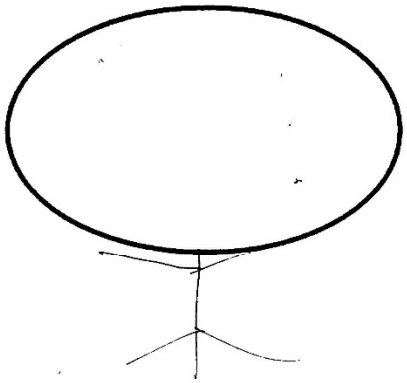
12) Name all the SQUARE things you can think of:

Basswood

13) _____ I prefer to work with others in a team rather than by myself.

a) Agree
b) Undecided or Don't Know
c) Disagree

14) Create an original drawing, incorporating the shape below, by adding any new shapes, lines, patterns, and/or words to create a scene below.



15) _____ I spend a great deal of time thinking about what other people think of me.

a) Agree

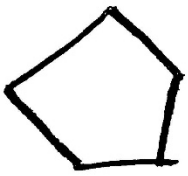
b) Undecided or Don't Know

c) Disagree

16) Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient; but unless the tumor is destroyed, the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays are directed at the tumor at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to the healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue? Write your solution in the lines provided below.

Psychological help.

17) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

18) _____ I typically arrive to class _____:
a) Early, Very
b) On time
c) Late

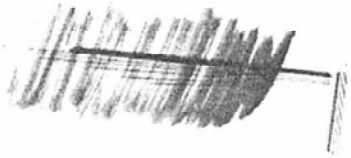
19) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SQUARE - CARDBOARD - OPEN – Wall

20) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLAKE - MOBILE - CONE – Icecream

21) _____ I work best and am most focused:
a) Early in the morning
b) In the middle of the day
c) Early in the evening
d) Late at night

22) _____ I'll try anything once to see what it's like.
a) True
b) False

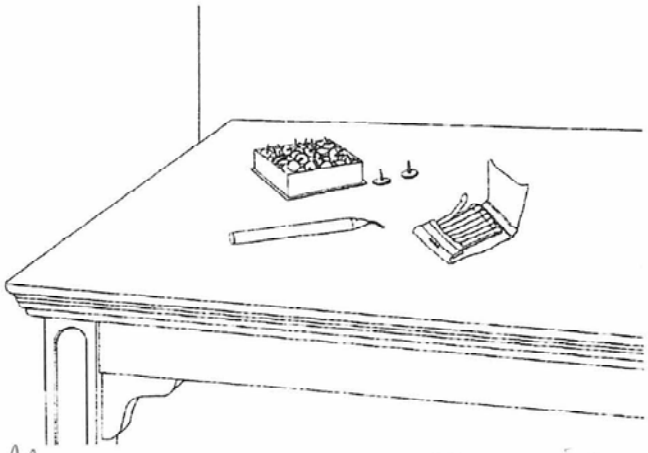
23) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

24) _____ I am wondering what the purpose of this survey is.
a) True
b) False

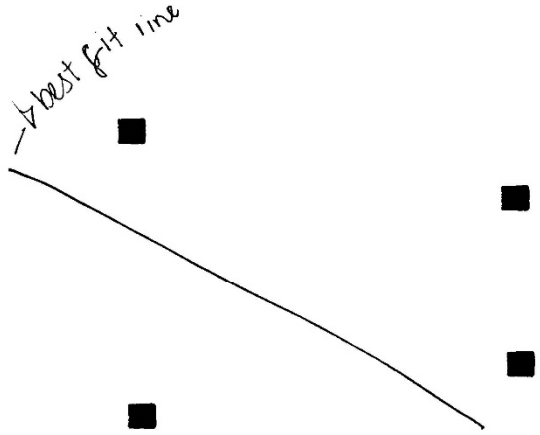
25) In this task, you need to figure out how to fix and light a candle on a wall (a cork board) in a way so the candle wax won't drip onto the table below. To do so, you may only use the following along with the candle: a book of matches and a box of thumbtacks. Write your solution to the problem in the lines provided below.



Make a cage around it, and knock a couple nails into it

26) What beverage do you drink first thing in the morning? WATER

27) Given the four dots shown below, connect all of the dots with TWO straight lines without lifting your pencil from the paper.



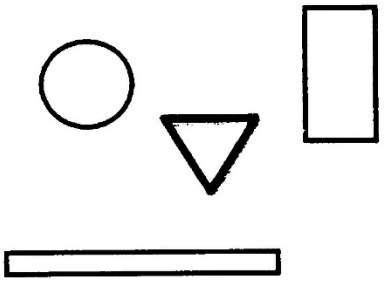

28) _____ I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

29) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SHADOW - CHART - DROP – RicFlair

30) _____ I prefer to work on projects:
a) By myself
b) With a small group of people
c) With a large group of people

31) Create an original drawing, incorporating the shapes below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



32) List all the possible consequences of people no longer needing to sleep.

33) I love the excitement of the unknown.
a) True
b) False

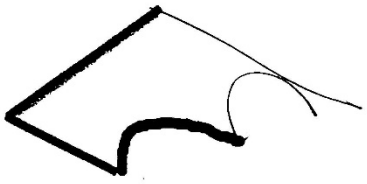
34) List three (3) good characteristics and three (3) bad characteristics about STAIRS:
– Procession
– View
– Dominance
– Fall down
– Height
– Too much

35) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLOWER - FRIEND - SCOUT – Boys

36) _____ I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

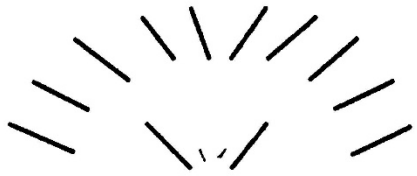
37) Create an original drawing, incorporating the lines below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



38) List as many as six possible uses for the following object:
AUTOMOBILE TIRE (used on the wheel of an automobile):

- Cruise

39) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.



40) In what ways would life be different if gravity did not exist?

We'll be high 24/7

41) Name all the items you can think of that MOVE ON WHEELS.

Pants
Axle

42) List as many as six possible uses for the following object:
WATCH (used to telling time):

-Flex
- Ice tray the gang

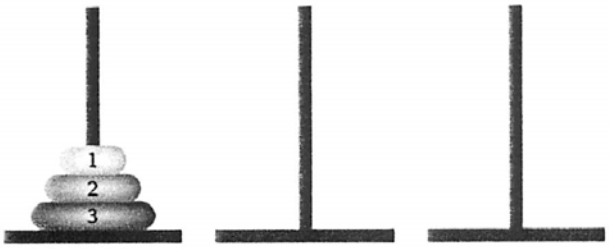
43) In what ways would life be different if gravity did not exist?

We'll be [illegible]

44) List as many as six possible uses for the following object:
BUTTON (used to fasten things): Clothes

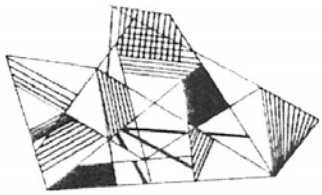
45) List all the ways in which MILK and MEAT are alike:
= Protein

46)
Three vertical rods are shown below with three disks of different sizes which can slide onto any rod. The disks are now in a neat stack in ascending order of size on the rod at the left, with the smallest disk at the top, thus making a conical shape.
The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules: Only one disk can be moved at a time.Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack.No disk may be placed on top of a smaller disk.
Write your solution in the lines provided below.




Je ne sais pas

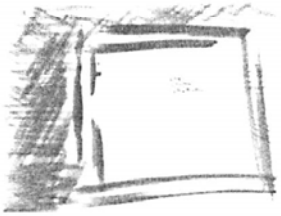
47) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

48) _____ How important is it for you to see someone demonstrating a task in order for you to learn it?
a) Very Important
b) Somewhat Important
c) Somewhat Unimportant
d) Not at all Important

49) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

50) _____ I sometimes feel as if others around me reach a solution to a problem sooner than I do.

a) True
b) False

51) N/A I often get my best ideas when doing nothing in particular.
a) Agree
b) Undecided or Don't Know
c) Disagree

52) Name all the items you can think of that MAKE A NOISE.

Guppy
Laubrah
Zein

53) List all the ways in which an APPLE and an ORANGE are alike:

Fruits

54) List as many as six possible uses for the following object:
NAIL (used for fastening):

Holding

55) _____ I consider myself to be a humorous person.
a) Agree
b) Undecided or Don't Know
c) Disagree

56) Review the three words below, then come up with a FOURTH word that is associated with all three words:
TENNIS - ROUND - MANNERS – Venus Williams

57) _____ In order to be creative, it helps me to be with a group of people I already know or am familiar with.
a) True
b) False

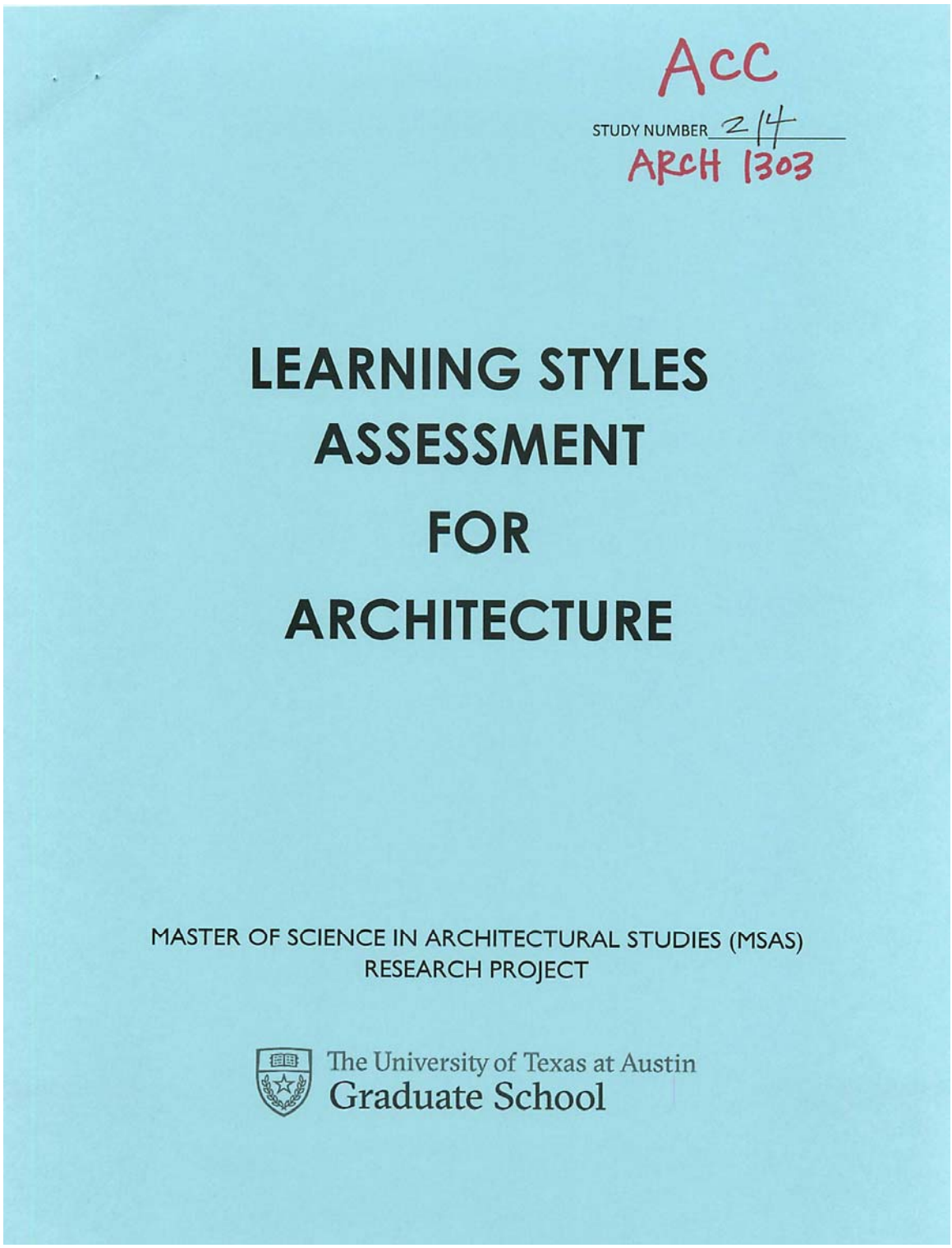
58) _____ I get bored easily.
a) True
b) False

59) _____ I feel that a logical step-by-step method is best for solving problems.
a) Agree
b) Undecided or Don't Know
c) Disagree

***DEMOGRAPHIC INFORMATION (OPTIONAL)***

- **AGE** 19
- **GENDER** M
- **RACE / ETHNICITY** Black

## APPENDIX E: CREATIVITY ASSESSMENT STUDENT EXAMPLE – ACC HIGH SCORE

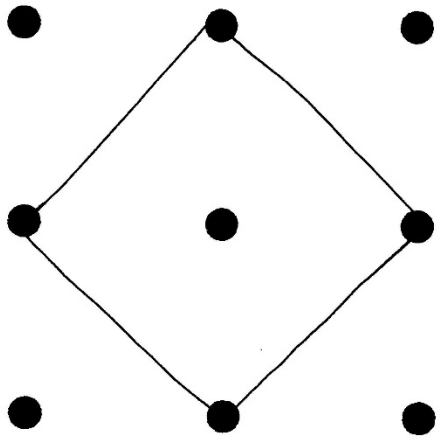


## ***GENERAL INFORMATION & INSTRUCTIONS***

- **THANK YOU FOR TAKING PART IN THIS SURVEY**
- **WORK QUICKLY THROUGH THE QUESTIONS, AND TRY NOT TO LINGER TOO LONG ON ANY SINGLE QUESTION**
- **THERE IS A TIME LIMIT OF 40 MINUTES**
- **DO NOT WRITE YOUR NAME OR ANY OTHER PERSONAL DATA ON THE ASSESSMENT BOOKLET**
- **IF YOU ARE WILLING TO ANSWER DEMOGRAPHIC QUESTIONS, THERE IS AN OPTIONAL SET OF QUESTIONS ON THE LAST PAGE OF THE BOOKLET**

1) _____ I often wonder what my professors think of my work.
(a) True
b) False

2) Given the nine dots shown below, connect all of the dots with FOUR straight lines without lifting your pencil from the paper.



3) Describe your childhood bedroom:
small, shared w/other siblings but had my own little part of it

4) List as many as six possible uses for the following object:
WOODEN PENCIL (used for writing):
Draw
straight edge ruler
Expressing self
Taking Note
Curing boredom
Endless possibilities

5) Review the three words below, then come up with a FOURTH word that is associated with all three words:
LIGHT - BIRTHDAY - STICK
CANDLE

6) List as many as six possible uses for the following object:
BED SHEET (used on bed):

Fort
Cover
PIONIC
Sleeping
Material for clothing
Ghost costume

7) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.

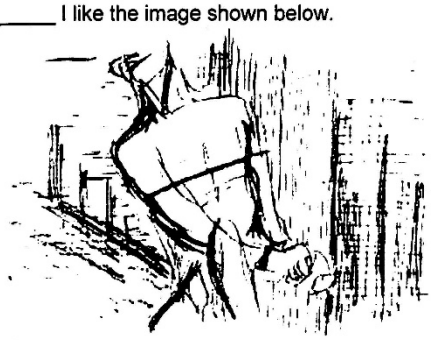
' Mountain Range ': Peak & Valleys
' EKG Monitor ': LIFE

8) _____ I enjoy hobbies that involve collecting things.
(a) Agree
b) Undecided or Don't Know
c) Disagree

9) _____ I have had a discussion about architecture with a family member.

(a) True
b) False

10) _____ I like the image shown below.



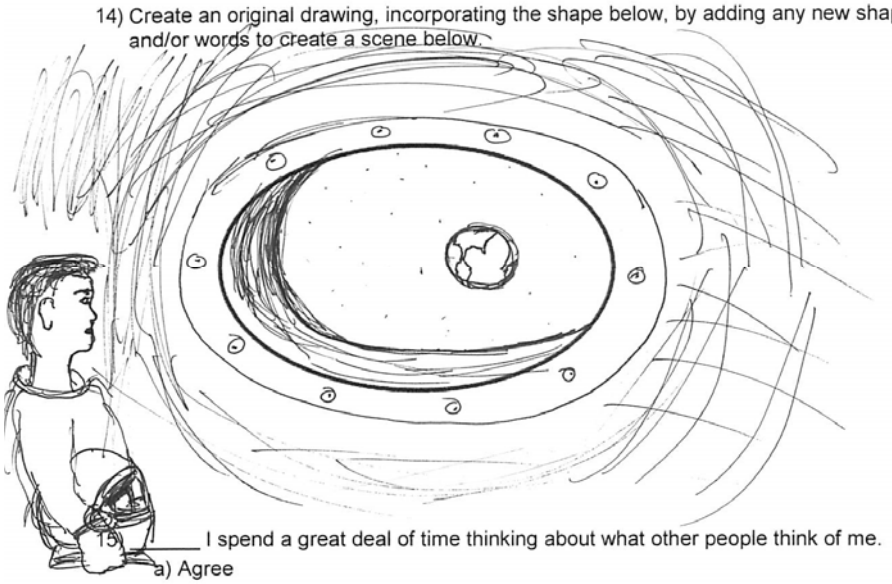
(a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

11) List all the ways in which a CAT and a MOUSE are alike:
· Ears · Legs · Nose · Eyes · Fur · Will to survive · Mammals · Tail
· HUNT for Food

12) Name all the SQUARE things you can think of:
· Tile · Neighborhoods · Windows · Grids

13) _____ I prefer to work with others in a team rather than by myself.
a) Agree
(b) Undecided or Don't Know
c) Disagree

14) Create an original drawing, incorporating the shape below, by adding any new shapes, lines, patterns, and/or words to create a scene below.



15) _____ I spend a great deal of time thinking about what other people think of me.

a) Agree

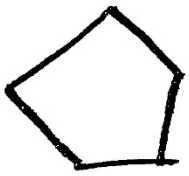
b) Undecided or Don't Know

(c) Disagree

16) Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient; but unless the tumor is destroyed, the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays are directed at the tumor at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to the healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue? Write your solution in the lines provided below.

Intervals from high intensity to low

17) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

18) _____ I typically arrive to class _____:
a) Early
b) On time
c) Late

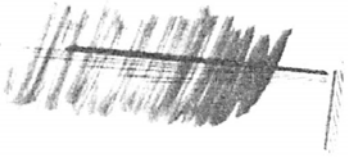
19) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SQUARE - CARDBOARD - OPEN
Box

20) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLAKE - MOBILE - CONE

21) _____ I work best and am most focused:
a) Early in the morning
b) In the middle of the day
c) Early in the evening
d) Late at night

22) _____ I'll try anything once to see what it's like.
a) True
b) False
c) Depends, "anything" is broad

23) _____ I like the image shown below.

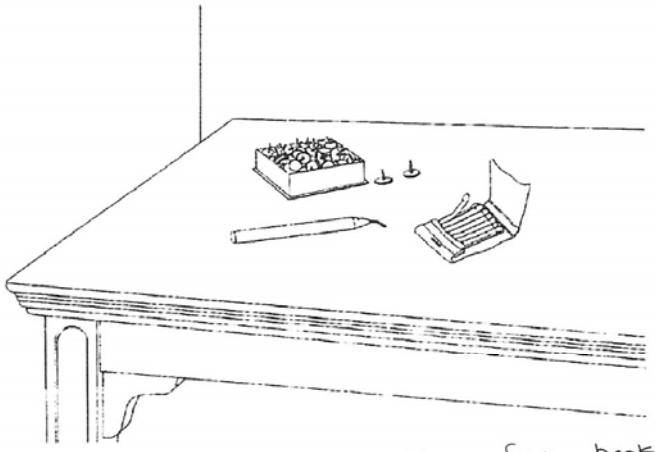


a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

24) _____ I am wondering what the purpose of this survey is.

a) True
b) False

25) In this task, you need to figure out how to fix and light a candle on a wall (a cork board) in a way so the candle wax won't drip onto the table below. To do so, you may only use the following along with the candle: a book of matches and a box of thumbtacks. Write your solution to the problem in the lines provided below.

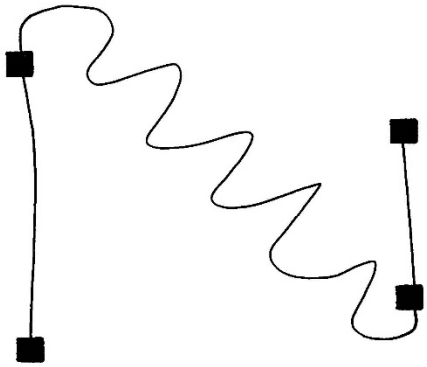


Book of matches with ~~cover~~ flap from book torn off, ~~under can~~
a hole w/the ~~same~~ circumfrance poked through it for candle to spill wax on.

26) What beverage do you drink first thing in the morning?

Water

27) Given the four dots shown below, connect all of the dots with TWO straight lines without lifting your pencil from the paper. .... Those are squares?



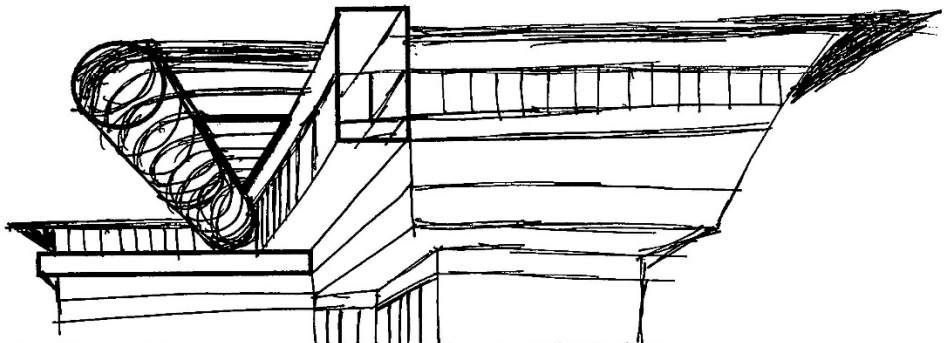
28) _____ I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

29) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SHADOW - CHART - DROP
STOCK Market

30) _____ I prefer to work on projects:
(a) By myself
(b) With a small group of people
c) With a large group of people

31) Create an original drawing, incorporating the shapes below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



32) List all the possible consequences of people no longer needing to sleep.
- more population w/more people awake
- more working

33) _____ I love the excitement of the unknown.
(a) True
b) False

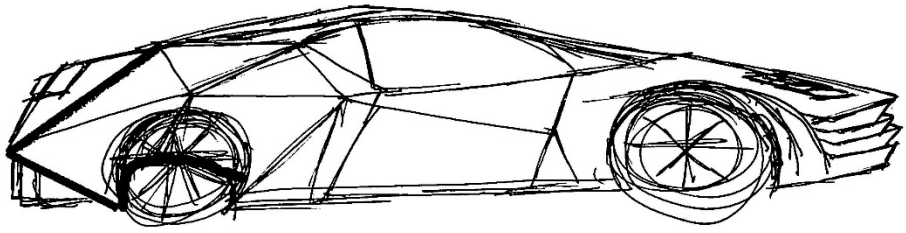
34) List three (3) good characteristics and three (3) bad characteristics about STAIRS:
- access up & Down
- Good for Blood flow
- Can be beatifully designed & Built
- Not wheel chair accessable
- Falling hazard
- Can be challenging/inconvenient

35) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLOWER - FRIEND - SCOUT
Girl Scouts in the wilderness

36) _____ I like the image shown below.

(a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

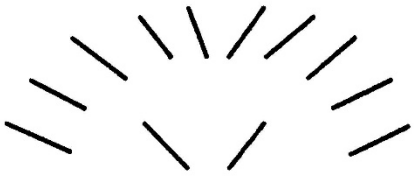
37) Create an original drawing, incorporating the lines below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



38) List as many as six possible uses for the following object:
AUTOMOBILE TIRE (used on the wheel of an automobile):

- Seat
- Good insulator
- Planter
- Cat home
- Good way to spend $$$ quickly
- Rodl

39) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.



"Reflecting Diamond: Thousands of Years later"

40) In what ways would life be different if gravity did not exist?

- Days would not be the same length
- No cars
- Constant drifting
- physics would be simple

41) Name all the items you can think of that MOVE ON WHEELS.

- Cars
- home
- chair
- dolly
- Toys
-

42) List as many as six possible uses for the following object:
WATCH (used to telling time):

- Style
- Sophistication
- paper-weight
- Collecting
- way to spend $$$
- Keep-sake

43) In what ways would life be different if gravity did not exist?

44) List as many as six possible uses for the following object:
BUTTON (used to fasten things):

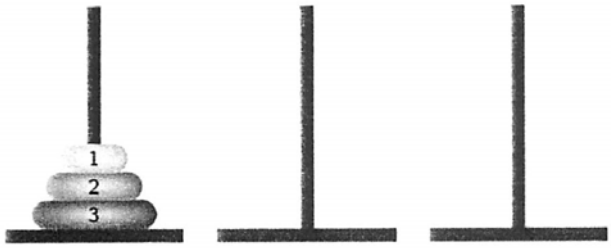
- for pants
- shirts
- devices
- Technology
- Nerves
- fidgetting

45) List all the ways in which MILK and MEAT are alike:

- Causes bloating
- high in protein
- high in fat
- Tastes great
- Rich in calcium
- Derrived from cows, goats & all ~~female~~ mammals

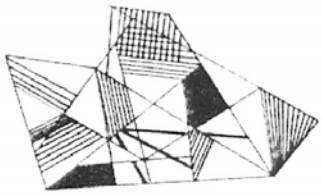
46)

Three vertical rods are shown below with three disks of different sizes which can slide onto any rod. The disks are now in a neat stack in ascending order of size on the rod at the left, with the smallest disk at the top, thus making a conical shape.
The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules: Only one disk can be moved at a time.Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack.No disk may be placed on top of a smaller disk.
Write your solution in the lines provided below.




move 1 by ~~itself~~ it's self
do same w/ 2
& Reverse order

47) _____ I like the image shown below.

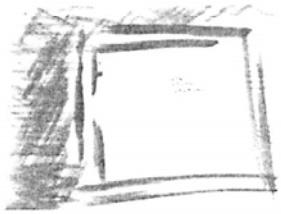


a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

48) _____ How important is it for you to see someone demonstrating a task in order for you to learn it?

a) Very Important
b) Somewhat Important
c) Somewhat Unimportant
d) Not at all Important

49) _____ I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

50) _____ I sometimes feel as if others around me reach a solution to a problem sooner than I do.

a) True
b) False

51) _____ I often get my best ideas when doing nothing in particular.

a) Agree
b) Undecided or Don't Know
c) Disagree

52) Name all the items you can think of that MAKE A NOISE.

chairs
doors
speakers
people
animals
heavy objects falling

53) List all the ways in which an APPLE and an ORANGE are alike:

- Fruits
- healthy
- edible
- skin
- from tree
- have juice

54) List as many as six possible uses for the following object:
NAIL (used for fastening):

- used with hammer
Drill
for making holes

55) _____ I consider myself to be a humorous person.

(a) Agree
b) Undecided or Don't Know
c) Disagree

56) Review the three words below, then come up with a FOURTH word that is associated with all three words:
TENNIS - ROUND - MANNERS

wimbledon

57) _____ In order to be creative, it helps me to be with a group of people I already know or am familiar with.

(a) True – sometimes
b) False

58) _____ I get bored easily.

a) True
(b) False

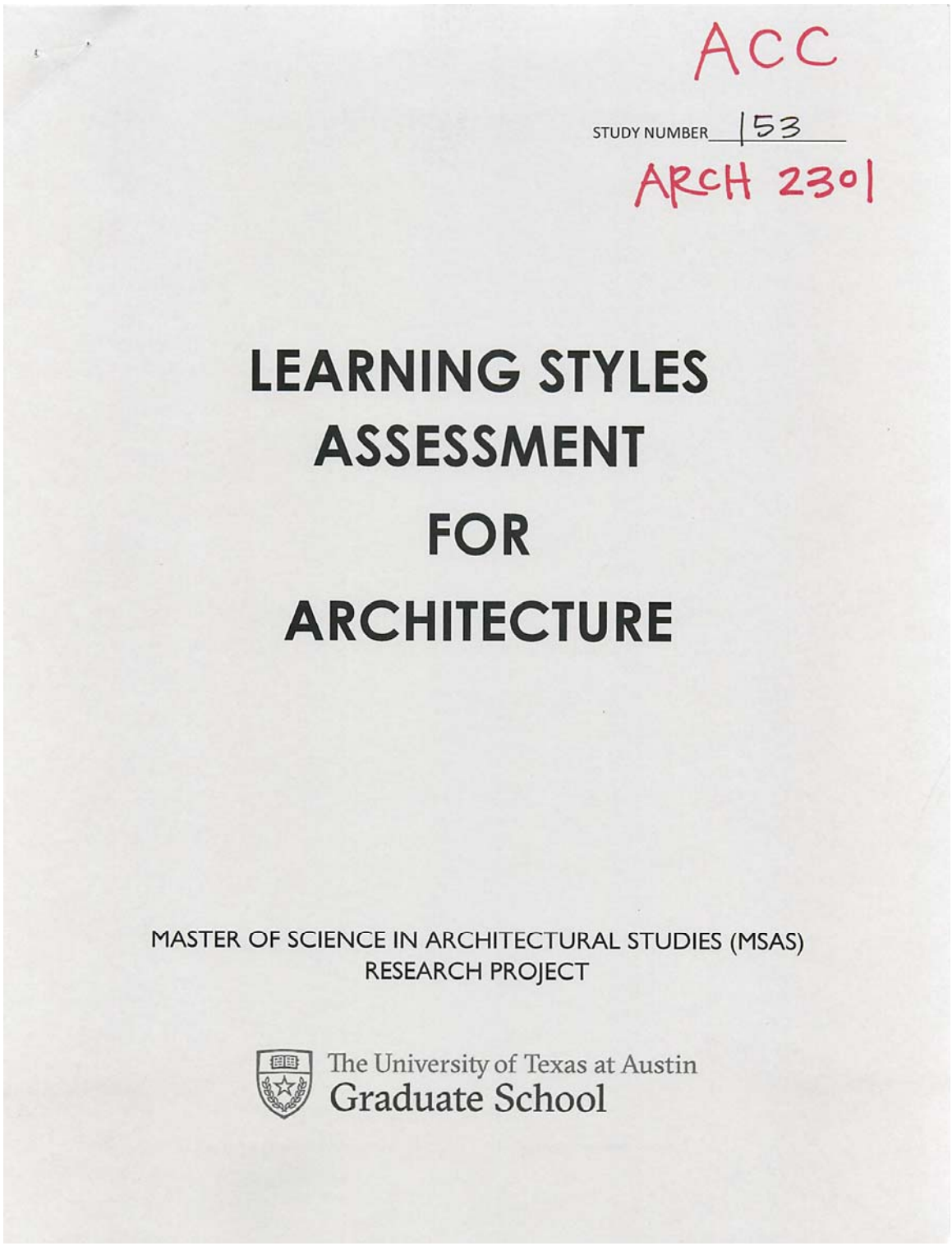
59) _____ I feel that a logical step-by-step method is best for solving problems.

(a) Agree
b) Undecided or Don't Know
c) Disagree

***DEMOGRAPHIC INFORMATION (OPTIONAL)***

- **AGE** 23
- **GENDER** MALE
- **RACE / ETHNICITY** HISPANIC

## APPENDIX F: CREATIVITY ASSESSMENT STUDENT EXAMPLE – ACC LOW SCORE



ACC

STUDY NUMBER 153

ARCH 2301

# LEARNING STYLES ASSESSMENT FOR ARCHITECTURE

MASTER OF SCIENCE IN ARCHITECTURAL STUDIES (MSAS)
RESEARCH PROJECT

The University of Texas at Austin
Graduate School

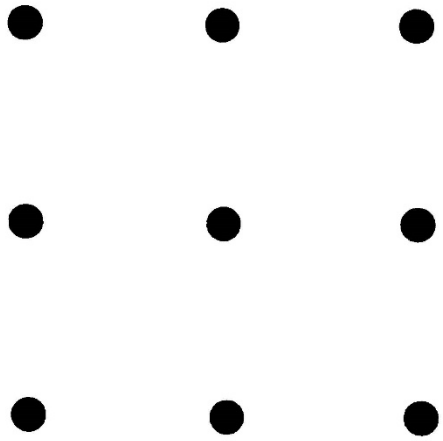
## ***GENERAL INFORMATION & INSTRUCTIONS***

- **THANK YOU FOR TAKING PART IN THIS SURVEY**
- **WORK QUICKLY THROUGH THE QUESTIONS, AND TRY NOT TO LINGER TOO LONG ON ANY SINGLE QUESTIONS**
- **THERE IS A TIME LIMIT OF 40 MINUTES**
- **DO NOT WRITE YOUR NAME OR ANY OTHER PERSONAL DATA ON THE ASSESSMENT BOOKLET**
- **IF YOU ARE WILLING TO ANSWER DEMOGRAPHIC QUESTIONS, THERE IS AN OPTIONAL SET OF QUESTIONS ON THE LAST PAGE OF THE BOOKLET**

LEARNING STYLES ASSESSMENT FOR ARCHITECTURE

1) A I often wonder what my professors think of my work.
   a) True
   b) False

2) Given the nine dots shown below, connect all of the dots with FOUR straight lines without lifting your pencil from the paper.



3) Describe your childhood bedroom:
Single twin bed w/ strawberry Shortcake bedding.
Antique dresser w/ mirror
large barbie house

4) List as many as six possible uses for the following object:
WOODEN PENCIL (used for writing):

5) Review the three words below, then come up with a FOURTH word that is associated with all three words:
LIGHT - BIRTHDAY - STICK candle

6) List as many as six possible uses for the following object:
BED SHEET (used on bed):
use to protect furniture
build a fort
ground cover for picnic

7) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.

8) A I enjoy hobbies that involve collecting things.
a) Agree
b) Undecided or Don't Know
c) Disagree

9) A I have had a discussion about architecture with a family member.

a) True
b) False

10) D I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

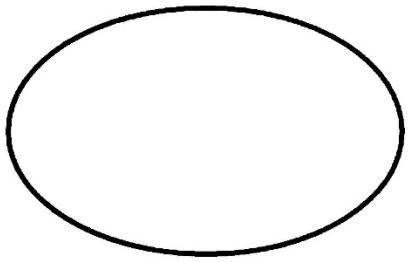
11) List all the ways in which a CAT and a MOUSE are alike:

12) Name all the SQUARE things you can think of:

13) C I prefer to work with others in a team rather than by myself.

a) Agree
b) Undecided or Don't Know
c) Disagree

14) Create an original drawing, incorporating the shape below, by adding any new shapes, lines, patterns, and/or words to create a scene below.



15) C I spend a great deal of time thinking about what other people think of me.

a) Agree

b) Undecided or Don't Know

c) Disagree

16) Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient; but unless the tumor is destroyed, the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays are directed at the tumor at a sufficiently high intensity, the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to the healthy tissue, but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue? Write your solution in the lines provided below.

17) C I like the image shown below.

a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

18) A I typically arrive to class _____:
a) Early
b) On time
c) Late

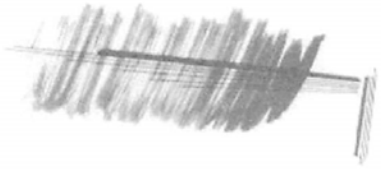
19) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SQUARE - CARDBOARD - OPEN BOX

20) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLAKE - MOBILE - CONE SNOW

21) B I work best and am most focused:
a) Early in the morning
b) In the middle of the day
c) Early in the evening
d) Late at night

22) B I'll try anything once to see what it's like.
a) True
b) False

23) C I like the image shown below.

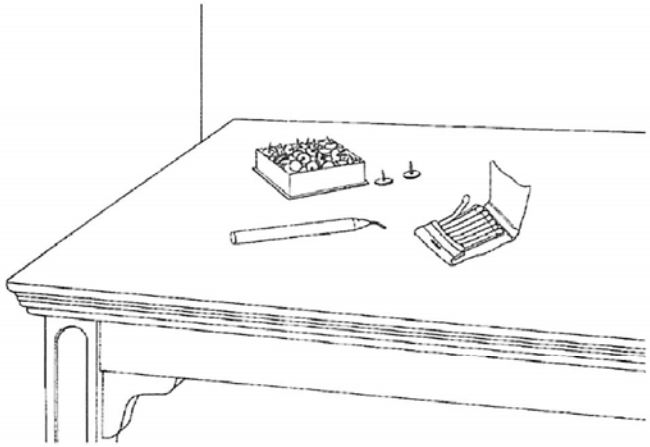


a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

24) A I am wondering what the purpose of this survey is.

a) True
b) False

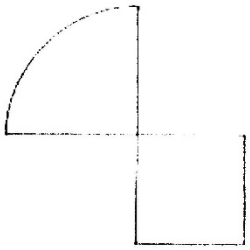
25) In this task, you need to figure out how to fix and light a candle on a wall (a cork board) in a way so the candle wax won't drip onto the table below. To do so, you may only use the following along with the candle: a book of matches and a box of thumbtacks. Write your solution to the problem in the lines provided below.



26) What beverage do you drink first thing in the morning? Tea

27) Given the four dots shown below, connect all of the dots with TWO straight lines without lifting your pencil from the paper.

28) C I like the image shown below.

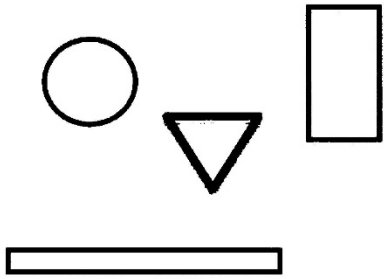


a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

29) Review the three words below, then come up with a FOURTH word that is associated with all three words:
SHADOW - CHART - DROP

30) A I prefer to work on projects:
a) By myself
b) With a small group of people
c) With a large group of people

31) Create an original drawing, incorporating the shapes below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



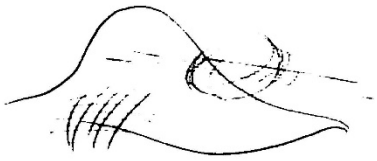
32) List all the possible consequences of people no longer needing to sleep.

33) B I love the excitement of the unknown.
a) True
b) False

34) List three (3) good characteristics and three (3) bad characteristics about STAIRS:

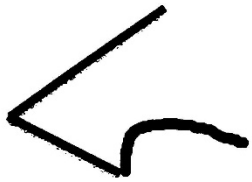
35) Review the three words below, then come up with a FOURTH word that is associated with all three words:
FLOWER - FRIEND - SCOUT

36) R I like the image shown below.



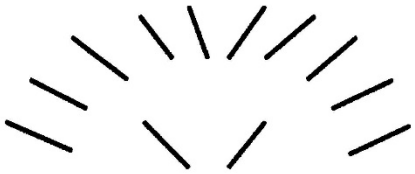
a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

37) Create an original drawing, incorporating the lines below, by adding any new shapes, lines, patterns, and/or words to create a new scene below.



38) List as many as six possible uses for the following object:
AUTOMOBILE TIRE (used on the wheel of an automobile):

39) This drawing is incomplete. What could this be if the drawing was complete? List as many answers as you can think of AND give the drawing a title.



40) In what ways would life be different if gravity did not exist?

41) Name all the items you can think of that MOVE ON WHEELS.

42) List as many as six possible uses for the following object:
WATCH (used to telling time):

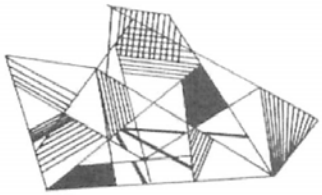
43) In what ways would life be different if gravity did not exist?

44) List as many as six possible uses for the following object:
BUTTON (used to fasten things):

45) List all the ways in which MILK and MEAT are alike:

46)
Three vertical rods are shown below with three disks of different sizes which can slide onto any rod. The disks are now in a neat stack in ascending order of size on the rod at the left, with the smallest disk at the top, thus making a conical shape.
The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules: Only one disk can be moved at a time.Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack.No disk may be placed on top of a smaller disk.
Write your solution in the lines provided below.

47) D I like the image shown below.

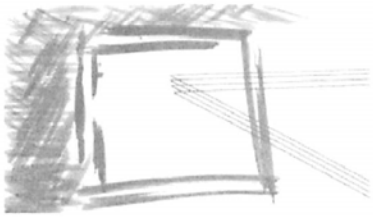


a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

48) A How important is it for you to see someone demonstrating a task in order for you to learn it?

a) Very Important
b) Somewhat Important
c) Somewhat Unimportant
d) Not at all Important

49) D I like the image shown below.



a) Agree
b) Undecided or Don't Know
c) Disagree
d) No Opinion

50) B I sometimes feel as if others around me reach a solution to a problem sooner than I do.

a) True
b) False

51) A I often get my best ideas when doing nothing in particular.

a) Agree
b) Undecided or Don't Know
c) Disagree

52) Name all the items you can think of that MAKE A NOISE.

53) List all the ways in which an APPLE and an ORANGE are alike:

54) List as many as six possible uses for the following object:
NAIL (used for fastening):

55) A I consider myself to be a humorous person.
a) Agree
b) Undecided or Don't Know
c) Disagree

56) Review the three words below, then come up with a FOURTH word that is associated with all three words:
TENNIS - ROUND - MANNERS

57) B In order to be creative, it helps me to be with a group of people I already know or am familiar with.
a) True
b) False

58) A I get bored easily.
a) True
b) False

59) A I feel that a logical step-by-step method is best for solving problems.
a) Agree
b) Undecided or Don't Know
c) Disagree

***DEMOGRAPHIC INFORMATION (OPTIONAL)***

- **AGE**_____
- **GENDER**_____
- **RACE / ETHNICITY**_____

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# Vita

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